Including Ham Radio Fun!

73 Amateur Radio Today

JANUARY 1998
ISSUE #448
USA $3.95
CANADA $4.95

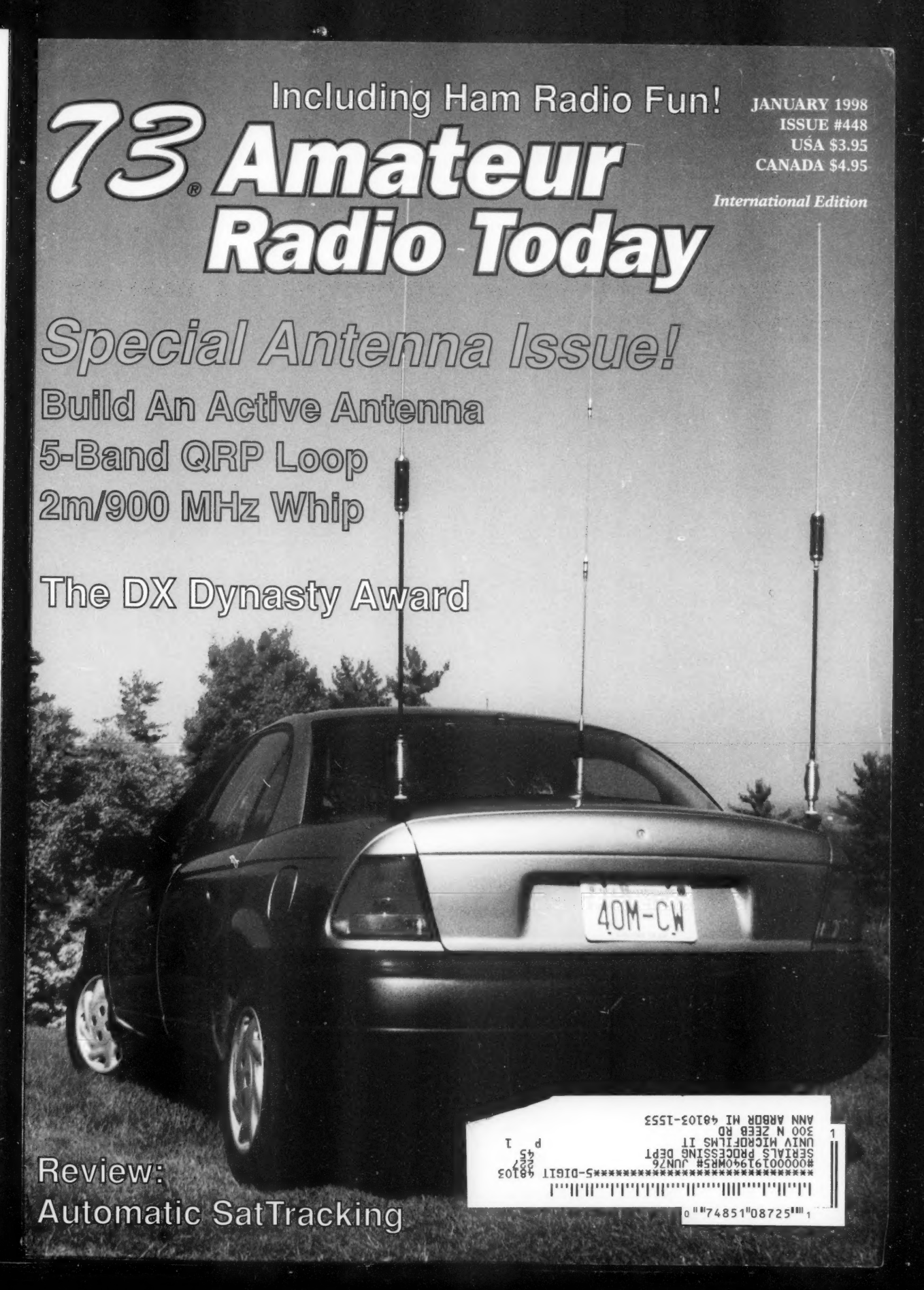
International Edition

Special Antenna Issue!

Build An Active Antenna
5-Band QRP Loop
2m/900 MHz Whip

The DX Dynasty Award

Review:
Automatic SatTracking



SYNTHESIZED VHF FM EXCITER & RECEIVER MODULES

No more waiting for crystals!

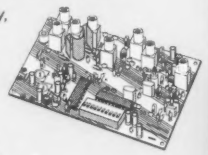
NEW

Hamtronics is pleased to announce a new line of its vhf fm transmitters and receivers, popular for repeaters, voice and data links, control, telemetry, and other demanding applications.

T301 Exciter and R301 Receiver provide high quality nbfm and fsk operation on 144-148 MHz (and 148-174 MHz for export and gov't services). Features include:

- *Dip switch frequency selection.*
- *Exceptional modulation for voice and ctcss.*
- *Very low noise synthesizer for repeater service.*
- *Direct fm for data up to 9600 baud.*
- *Commercial grade tcxo for tight frequency accuracy in wide range of environmental conditions: 2ppm -30 to +60°C.*
- *In stock for same day shipping.*

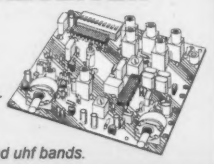
T301 EXCITER



Rated for continuous duty, 2-3W output.

- **Kit** .....only $109
- TCXO option ...$40
- **Wired/tested** ...$189 (includes TCXO)
- Inquire about models for higher frequencies.

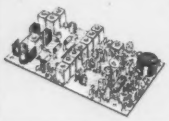
R301 RECEIVER



- **Kit** .....only $139
- TCXO option ...$40
- **Wired/tested** ...$209 (includes TCXO)
- *Our traditional crystal-controlled receivers and exciters are still available for all vhf and uhf bands.*

CRYSTAL CONTROLLED VHF & UHF FM EXCITERS & RECEIVERS

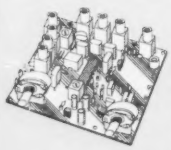
FM EXCITERS: 2W output, continuous duty.



- **TA51:** for 6M, 2M, 220 MHz ..... kit $99, w/t $169.
- **TA451:** for 420-475 MHz. ..... kit $99, w/t $169.
- **TA901:** for 902-928 MHz, (0.5W out) .....w/t $169.

VHF & UHF POWER AMPLIFIERS.
Output levels from 10W to 100W .....**Starting at $99.**

FM RECEIVERS:



- **R100 VHF FM RCVRS**
  Very sensitive – 0.15µV.
  Superb selectivity – both crystal and ceramic IF filters, >100 dB down at ±12 kHz, best available anywhere, flutter-proof squelch.

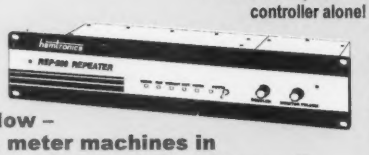
For 46-54, 72-76, 140-175, or 216-225 MHz. .... kit $129, w/t $189.

- **R144 RCVR.** Like R100, for 2M, with helical resonator in front end. ..... kit $159, w/t $219.
- **R451 FM RCVR,** for 420-475 MHz. Similar to R100 above. ..... kit $129, w/t $189.
- **R901 FM RCVR,** 902-928MHz .....$159, w/t $219.

Get more features for your dollar with our

REP-200 REPEATER

A microprocessor-controlled repeater with full auto-patch and many versatile dtmf remote control features at less than you might pay for a bare bones repeater or controller alone!



Now – 2 meter machines in stock for next day shipment!

- ***kit still only $1095***
- ***factory assembled still only $1295***

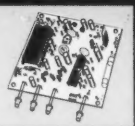
50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)
☞ **FCC type accepted** for commercial service in 150 & 450 MHz bands.

Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!** ..... only $100.

REP-200C Economy Repeater. **Real-voice ID,** no dtmf or autopatch. ..... Kit only $795, w&t $1195.

REP-200N Repeater. Without controller so you can use your own. ..... Kit only $695, w&t $995.

You'll KICK Yourself If You Build a Repeater Without Checking Out Our Catalog First!



Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.

COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. .....**only $49/kit, $79 w/t.**

CWID. Traditional diode matrix ID'er. .....**kit only $59.**

CWID-2. Eprom-controlled ID'er.....**only $54/kit, $79 w/t.**

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. .....**$59/kit, $99 w/t.**

COR-4. Complete COR and CWID all on one board. ID in eprom. Low power CMOS. .....**only $99/kit, $149 w/t.**

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. .....**kit only $99, w/t only $149.**

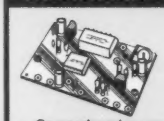
COR-5. µP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. .....**$379 w/t.**

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. ..... **kit $89.**

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. ..... **kit $79.**

TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you..... **kit $49.**

SUBAUDIBLE TONE ENCODER/DECODER



Access all your favorite closed repeaters!

- **Encodes** all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- Comprehensive manual also shows how you can set up a front panel switch to select tones for several repeaters.
- **Decoder** can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying buzz in receiver.

- **TD-5** CTCSS Encoder/Decoder Kit ..... only $39
- **TD-5** CTCSS Encoder/Decoder Wired/tested $59

LOW NOISE RECEIVER PREAMPS

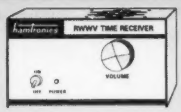
LNG-( ) GaAs FET PREAMP
STILL ONLY $59, wired/tested

- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.
- *Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.*

LNW-( ) ECONOMY PREAMP
ONLY $29 kit, $44 wired/tested

- Miniature MOSFET Preamp
- Solder terminals allow easy connection inside radios.
- *Available for 25-35, 35-55, 53-90, 90-120, 120-150, 150-200, 200-270, and 400-500 MHz bands.*

WWV RECEIVER



Get time & frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation. Very sensitive and selective crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive receivers.

- **RWWV Rcvr kit,** PCB only **$59**
- **RWWV Rcvr** kit with cabt, spkr, & 12Vdc adapter **$89**
- **RWWV Rcvr** w/t in cabt with spkr & adapter **$129**

WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellites!

A very sensitive wideband fm receiver optimized for NOAA APT and Russian Meteor weather fax images on the 137 MHz band.

The R139 is lower cost and easier to maintain than synthesized units. And it is designed from the ground up for optimum satellite reception; not just an off-the-shelf scanner with a shorted-out IF filter!

Covers all five satellite channels. Scanner circuit and recorder control allow you to automatically search for and tape signals as satellites pass overhead, even while away from home.

- **R139 Receiver Kit less case** **$159**
- **R139 Receiver Kit** with case and AC power adapter **$189**
- **R139 Receiver w/t in case** with AC power adapter ...**$239**
- Internal PC Demodulator Board and Imaging Software **$289**
- Turnstile Antenna **$119**
- Weather Satellite Handbook **$20**

WEATHER ALERT RECEIVER

A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!

Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; **all 7 channels provided** (162.40 to 162.55).

You can buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. It is also available factory wired and tested.

- **RWX Rcvr kit,** PCB only **$79**
- **RWX Rcvr kit with cabinet, speaker, & AC adapter** **$99**
- **RWX Rcvr wired/tested in cabinet with speaker & adapter** **$139**

Buy at low, factory-direct net prices and save!
For complete info, call or write for complete catalog.
Order by mail, fax, email, or phone (9-12, 1-5 eastern time).
Min. $5 S&H charge for 1st lb. plus add'l weight & insurance.
Use Visa, MC, Discover, check, or UPS C.O.D.

View Catalog on our Web Site:
www.hamtronics.com
email: jv@hamtronics.com

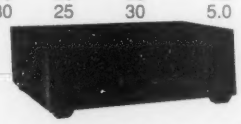
Our 35th Year

hamtronics, inc.
65-D Moul Rd; Hilton NY 14468-9535
Phone 716-392-9430 (fax -9420)

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277 • FAX (714) 458-0826 www.astroncorp.com

SWITCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-10	7	10	3.2
SS-12	10	12	3.4
SS-18	15	18	3.6
SS-25	20	25	4.2
SS-30	25	30	5.0



SS-25M With volt & amp meters
SS-30M With volt & amp meters

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

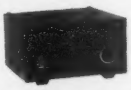
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

• LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅞ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅞ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

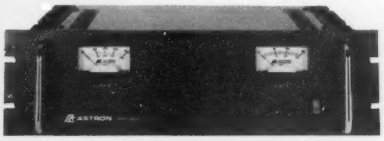
RS-L SERIES



• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

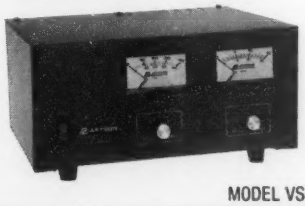
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES



MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	67	34	16	70	6 x 13¾ x 12⅛	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅞ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

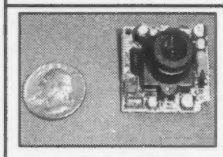
RAMSEY Wireless Video Headquarters

The Cube

World's Smallest TV Transmitter

Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies- that's a nickel in the picture! Transmits color or B&W up to 150' to any TV tuned to cable channel 59 with a solid 20 mW of power. Crystal controlled for no frequency drift with performance that equals law enforcement models that cost hundreds more! Deluxe model includes sound using a sensitive built-in mike that will hear a whisper 15 feet away! Units run on 9 volts and hook-up to most any CCD camera. Our cameras shown below have been tested to mate perfectly with The Cube and work great. Fully assembled.

C-2000 Video Transmitter Cube.....$89.95
C-3000 Video and Audio Transmitter Cube.....$149.95

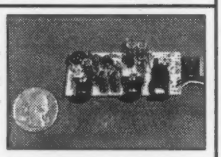


CCD Video Cameras

If you're looking for a good quality CCD board camera, stop right here! Our cameras use top quality Japanese Class 'A' CCD arrays, not the off-spec arrays that are found on many other cameras. You see, the Japanese suppliers grade the CCDs at manufacture and some manufacturers end up with the off-grade chips due to either cost constraints or lack of buying 'clout'. These cameras have nice clean fields and excellent light sensitivity, you'll really see the difference, and if you want to see in the dark, these are super IR (Infra-Red) sensitive! Available with Wide-angle (80º) or super slim Pin-hole style lens. Both run on 9 VDC and produce standard 1 volt p-p video. Add one of our transmitter units for wireless transmission to any TV set, or add our Interface board (below) for Audio sound pick-up and direct wire connection to any Video monitor or TV video/audio input jacks. Fully assembled.

CCDWA-2 CCD Camera, wide-angle lens.....$99.95
CCDPH-2 CCD Camera, slim fit pin-hole lens.....$99.95

CCD Camera Interface Board



Here's a nifty little kit that eases hook-up of your CCD camera module to any video monitor, VCR or video input TV set. The board provides a voltage regulated and filtered source to power the camera (CCD Cameras require a stable source of power for best operation), sensitive electret condensor mike for great sound pick-up and RCA Phono jacks for both audio and video outputs. Runs on 11 - 20 VDC.

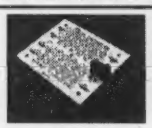
IB-1 Interface Board Kit.....$14.95

Budget TV Transmitter

Transmit audio and video to any TV set with this fully assembled transmitter. Although not tiny, it still offers some neat features. Takes standard 1 volt p-p video and audio and transmits on any UHF TV channel of your choice from 17 - 42. Has rugged metal case, includes AC adapter, whip antenna and even RCA phono plug patch cords! Can also run on 12 VDC.

VS-2 Video and Audio Sender, Fully Assembled.....$29.95

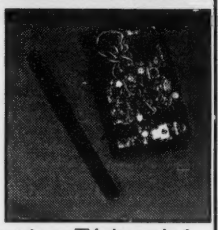
IR Illuminator for CCD Cameras



See in total darkness with one of our CCD video cameras and this IR illuminator! IR light can't be seen, illuminate the scene with IR and a CCD camera 'sees' just fine. The array of 24 extra high intensity LEDs are invisible to anybody - except for aliens and Casper! Runs on 12 VDC. Illuminates similar to that of a bright flashlight.

IR-1 IR Illuminator Kit.....$24.95

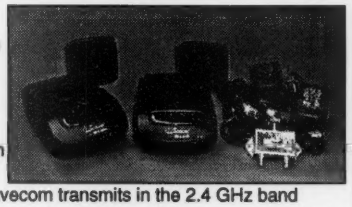
MicroEye CCD Camera & Transmitter Combo



We married together one of our quality CCD cameras, a sensitive electret microphone and a small TV transmitter to give you a super neat - and tiny - all in one, 'knows all, sees all, hears all' package! Small enough to fit into a cigarette pack and powerful enough to transmit up to 150' to any standard TV set. Tunable to operate on TV channels 4, 5, or 6 and runs on 9 to 20 VDC. The sensitive mike picks up normal voice within an average size room. Ideal for private detectives, investigators, hobbyists, babysitters, model rocketeers, RC airplanes and other uses limited only by your imagination. Camera module is fully wired and the transmitter unit is an easy to build kit that goes together in an evening. Includes all parts, handsome jet-black case and clear, concise instructions with ideas for use. And, don't forget, our CCD cameras are very sensitive to IR light - just add the IR-1 IR Illuminator kit for see-in-the-dark operation!

ME-2000 MicroEye TV Transmitter Combo $149.95

Wavecom Wireless Video and Audio Transmission System



Transmit extremely clean and sharp video and audio up to 300 feet. Wavecom transmits in the 2.4 GHz band using FM and circular polarization for state-of-the-art transmission. There is no fading, ghosting, humming, buzzing or picture rolling when using the Wavecom. System consists of two parts, a transmitter unit and a receiver unit. Switch selectable 4 channel operation allows use of multiple Wavecoms in the same geographic area. Connections are video and audio in and out using standard RCA phono jacks. Includes AC wall plug adapters, patch cords, coax cable jumper, TV antenna A/B switch and complete hook-up instructions. Fully assembled with one year warranty.

The Wavecom Sr. has all of the features above plus adds the capability of transmitting your TV/DSS/VCR remote control signals from the receiver unit back to the transmitter unit. This is great for controlling your DSS satellite receiver or VCR from any room in the house. We also offer the small internal transmitter module assembly for those who wish to make their own concealed video transmitter system. Module is about the size of a couple of matchboxes and includes microwave patch antenna.

WC-1 Wavecom Jr. Wireless System.....$189.95
WC-5 Wavecom Sr. with Remote Capability.....$239.95
WC-TX Transmitter Module Assembly.....$105.00

RAMSEY ELECTRONICS, INC.
793 Canning Parkway Victor, NY 14564
Call for our free catalogue or visit us on the web: www.ramseyelectronics.com

Toll-free Order Service: 1-800-446-2295
Sorry, no technical info or order status at this number

For Tech Info or Order Status, Call the Factory Direct
Phone (716) 924-4560
Fax (716) 924-4555

JANUARY 1998
ISSUE #448

73® Amateur Radio Today

Including Ham Radio Fun!

TABLE OF CONTENTS

Business Office
Editorial - Advertising - Circulation
Feedback - Product Reviews
73 Amateur Radio Today Magazine
70 Route 202N
Peterborough NH 03458-1107
603-924-0058
Fax: 603-924-8613

Reprints: $3 per article
Back issues: $5 each

Printed in the USA by
Quad Graphics

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article [IBM (ok) or Mac (preferred) formats], carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens must include their Social Security number with submitted manuscripts so we can submit it to you know who.

FEATURES

DEPARTMENTS

REVIEW

HAM RADIO FUN SECTION

On the cover: Carefully installed antennas and cables let Andrew Moore NV1B enjoy mobile CW and 2 meter FM without the distractions of safety hazards or messy looking wires. The choice of multiple narrowbanded 40 meter resonators and a trunk-mounted coax switch provide good bandwidth while eliminating high wind loads and antenna tuners. In classic OM form, NV1B sneaked out of the house on the morning of his wedding day to capture a little of New Hampshire's famous fall foliage atop Stratham Hill Park, site of the Port City Amateur Radio Club's 1997 Field Day operations. Our best wishes to Andrew and his new XYL!

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

73 Amateur Radio Today (ISSN 1052-2522) is published monthly by 73 Magazine, 70 N202, Peterborough NH 03458-1107. The subscription rate is: one year $24.97, two years $44.97; Canada: one year $34.21, two years $57.75, including postage and 7% GST. Foreign postage: $19 surface, $42 airmail additional per year, payable in US funds on a US bank. Second class postage is paid at Peterborough, NH, and at additional mailing offices. Canadian second class mail registration #178101. Canadian GST registration #125393314. Microfilm edition: University Microfilm, Ann Arbor MI 48106. POSTMASTER: Send address changes to *73 Amateur Radio Today*, 70 N202, Peterborough NH 03458-1107. 73 Amateur Radio Today is owned by Shabromat Way Ltd. of Hancock NH.

Contract: By being so nosey as to read this fine print, you have just entered into a binding agreement with *73 Amateur Radio Today*. You are hereby obligated to do something nice for a ham friend—buy him a subscription to *73*. What? All of your ham friends are already subscribers? Donate a subscription to your local school library!

NEVER SAY DIE

Wayne Green W2NSD/1

Virus Attack!

I see where the Magic Kingdom® has been threatened with St. Louis encephalitis. Eleven Florida counties are on the alert, plus Long Island, Massachusetts, North Dakota and Georgia. It's those pesky skeeters, and if one gets you there's a 20% chance that you'll bite the dust. But if you don't die, you'll get awfully sick.

Why am I rattling your cage about something over which you have so little control? Because that sneaky little Bioelectrifier (May issue) might just be the key to whupping the skeeter-spread virus. If you've built one of these gadgets and are in any of the infected areas, you could do worse than try to find a doctor who is at least willing to try it. Since they have no drug or surgical measures handy to tackle the virus, maybe you can recruit an MD to at least test it on his next encephalitis victim.

The BE seems tailor-made for this emergency. But then, I'm getting all sorts of weird reports of its use—like one chap who had an abscessed tooth. He used the BE with one electrode to the toothal area and in a couple of days the tooth was no longer infected. Headaches, backaches, colds, flu, and so on are being reported aborted. If this keeps up the whole medical industry will be outraged, calling for drastic FDA measures to stop this threat to their revenues.

In the meantime the Disney folk are closing pools and water parks in the evenings and the public health department is putting flocks of chickens around the swampy areas. They test them once a week for the virus.

What, you haven't made a Bioelectrifier yet? Forsooth! Is there no end to your procrastination?

Heritage

Most of us want what's best for our kids. We want to do everything we can to make sure they are healthy and happy. Well, for some families that's true, as long as it isn't too much trouble.

One of the reasons I've weathered well and already outlived half of my compatriots has to do with my diet as a youngster. My mother cooked breakfast every morning. Cooked lunch. Cooked dinner. The kitchen was the family center. She cooked eggs dozens of different ways. There was an array of different hot cereals on the pantry shelves. White toast? No way. Jelly and jam? None. Cold cereal? I didn't get to eat that until I went away to choir camp when I was 12. Yeah, I sang in the church choir every Friday night and Sunday morning and evenings, with choir practice on Wednesday afternoons.

I never even tasted Coke® until I was in my third year of high school. Or any other soft drinks.

Dad would get furious if he came down for breakfast and mother didn't have something different. The same breakfast twice in a month would have him storming around about having the same goddamn thing every morning.

So, while the friends I've outlasted were eating corn flakes, Force™, and puffed wheat, I was eating unsugared Wheatena™, Cream of Wheat™, and red flannel hash with a poached egg. Or scrapple, fried corn mush, home fries, corn fritters, buckwheat cakes, and so on.

I came home from school for lunch and it was always a hot lunch, with my mother reading to me as I ate. That may have something to do with my huge library and my reading two or three books a week. How about a slice of toast with a slice of cheese on it? Add to that a thin slice of onion and a couple strips of bacon grill until the cheese melts and sprinkle with paprika. That's heavenly!

Cookies and milk in the afternoon? We didn't have any cookies in the house and I didn't get hungry until dinner time anyway.

One result of all this was that I had perfect teeth until I'd been in the Navy for three years during WWII. That's when I had my first filling.

So what are you feeding your kids for breakfast? Sugar-coated fruit loops? Boo-Berries? Bread and jam? Is the TV on instead of reading to 'em? Some heritage! If you want healthy kids, give them a good start with the food their bodies need. Fruits, vegetables, meat. There's a lot of evidence that if you are going to include milk, you'd better get it from a health food store. Organic. The supermarket product often is laced with the hormones and antibiotics they feed cows to improve their milk production.

Read to your kids when they eat breakfast and lunch. How many poems have your kids learned? I still remember many of the poems I learned when I was six and seven years old.

The UPS Strike

First, the strike had little to do with wages or working conditions and everything to do with a big union fighting a big business for power. The rest was just the usual smoke and mirrors.

In this time of record low unemployment what reason is there for someone to work for UPS who is unsatisfied with the pay or working conditions?

When unions were started during the depression of the 1930s they were needed. The country had high unemployment and that made it so many employers were able to take advantage of the situation and pay very low wages while maintaining terrible working conditions. But even then, people with marketable skills and education had little trouble in getting work, so the unions tended to gather the unskilled together to force employers to pay higher wages.

Naturally this quickly got out of hand and we saw many unions forcing wages far beyond their market value and keeping the wages high by preventing more people, no matter how skilled, from joining.

When I started *73* in 1960 my first printer, O'Brien Press, had a union shop, so I got to know the union workers firsthand as they worked on each issue of my magazine. The printer's union was very protective. They'd only let the sons of members join. No outsiders need apply. And the printing companies could not hire anyone but union workers. The result was astronomical wages for truly stupid and only semi-skilled workers—workers who had no incentive to either learn more or perform well since they essentially couldn't be fired. The situation was much like what I found when I went to Russia and tried to deal with clerks in the government stores.

I remember one day when

the son of the owner of the printing company was showing a visitor around and he ran a piece of paper through a small proof press. The entire union membership walked out.

Before that, I'd found the same situation in the television business. The stagehands' union was both closed to newcomers (unless family members), and protective of marginally skilled highly paid workers. On the TV set, if the director dared to move a lamp on a table on a set, the stagehands would go on strike because he touched a prop.

It was well known on Broadway that on Friday if the stagehands weren't paid before the start of the last act of a play, the play would not be allowed to go on. And paid in cash. None of this check business.

Maybe you remember the featherbedding of the rail unions.

No one has been holding a gun to the UPS workers' heads, keeping them from quitting. If they could get better pay and/or working conditions elsewhere, they'd be out of there.

Companies, as far as I know, have no responsibility to pay people more than they're worth just because the worker feels it is "owed" to him. If he's really worth more, then he should find an employer he can convince of that. And keep the employer convinced.

As someone who has had over a thousand employees over the years I can testify that very few of them, despite my best efforts at recruitment and subsequent encouragement, ever made any serious effort to be really outstanding at their work. Most did the least they could get away with. Unless watched they would come in late, leave early, and take amazingly long lunches. The bottom line for me was that I had to hire ten people to do the work of maybe five.

The few employees who took advantage of the learning experience I offered them have done very well. The others I run into now and then, still working at some stupid job and still doing as little as possible.

It is pathetically easy to be better at what you do than 90% of those around you. Make that 99%, and it's still low.

I went to work at WPIX-TV in New York as an engineer. It wasn't long before I was chief cameraman. But then no one else on the engineering staff made any effort to learn and build their skills. I left there to become a director at KPIX in San Francisco. At WXEL in Cleveland I directed all of their network originations.

You are the one in charge of your fate, not your boss. If you need the brute force of a union to get more pay, you're lazy and unmotivated.

New Licenses

The FCC's figures for August 1997 show a drop of 94% in just the last two years in new General and Extra Class licenses. The new Advanced Class licenses dropped by 91%. Fortunately, the number of Techs upgrading to General only dropped by 42% in the same period. Which means, I suppose, that the ARRL Directors' sneaky plan to eliminate QRM on our HF bands is working. And just in time, too, what with the sunspots expected to get things back into action on what is projected to be one of the most active sunspot cycles in history.

Well, QRM has been the bane of HF operation ever since hamming started, so I, for one, will be delighted to not have to worry about it any more. But we hams will always be complaining, only now it'll be about those damned three-station pileups on rare DX.

When the last active ham in Wyoming dies will we be seeing Japanese DXpeditions going to Wyoming for the tens of thousands of young Japanese state hunters?

As an old 20 m fan, I'm beginning to appreciate the ARRL's single-minded insistence on maintaining the CW Great Wall to keep what few newcomers we're attracting to the hobby up there on 2 m and keep the HF bands for us old timers. But then amateur radio has always been primarily for old men, right? OMs. Oh, we old men dream about young ladies (YLs), but when's the last time you heard one on 20 m? I worked an OL on 20 m back in 1965. I'd been on the frequency for a couple of hours making contacts when she broke in and told me to get the hell off there, that it was the YLRL's frequency. Sigh. Hi, Evelyn, remember that one? I was operating from PJ3CC.

Speaking (well, writing) of newcomers, how're we doing on new no-code Techs? Pretty good—they've only dropped off 61% in the last two years.

Are You Ready?

A while back I suggested that it would be prudent for hams living around our major cities to get serious about setting up emergency communications systems. Now comes news that the Soviets are missing around a hundred of their suitcase-sized nuclear bombs. Of course they're only kiloton devices, not like the 10-kiloton bombs we dumped on Hiroshima and Nagasaki, so they would probably only blow a medium-sized hole in a big city, plus wipe out a few million people with the radiation. And probably also wipe out any solid state electronic equipment for a few miles around with its EMP pulse.

There is no shortage of groups pissed off at us who might want to smuggle such a suitcase into downtown Manhattan and put an end to Wall Street, or maybe try to do us a big favor by wiping out as much of Washington as they could. It might take two suitcases to take care of the Pentagon and the Congressional buildings, but that could still leave the CIA HQ in Langley intact. Say, where's the IRS HQ? Oh well, that's a self-serving thought and not worthy of me.

You're going to need a mobile command station with a portable repeater and as many still working HTs as you can find. And the more you're able to intercommunicate with other services the better. And don't forget some Geiger counters.

In the case of New York, fortunately very few hams live in downtown Manhattan, so most hams, living in the other four boroughs and on Long Island, could survive the blast. But it's going to be a communications nightmare.

The cell phone and telephone systems will probably be out of commission for months, depending somewhat on how high up the bomb is exploded.

Is there a danger to Cleveland, Chicago, San Francisco, Atlanta and other major cities? With a hundred missing bombs and guys like Saddam Hussein and Qadafi with both the money to buy them and the means to set them off anywhere they want, who knows? North Korea is mad at us too, and something like this might keep us busy enough to let them invade South Korea again.

But even groups who haven't managed to buy a bomb could demand ransom to not set off a bomb that they just might have. That's a very attractive business proposition.

I'm willing to bet that, despite the danger, I won't see one single hint of any effort by ham clubs in or near our major cities making any effort to improve their emergency communications capabilities. I'll be watching the club newsletters, hoping that I'm wrong.

ET Mischief

A local paper ran a story about a cylinder-shaped UFO that hovered over Hinsdale NH one night. A little later a nearby farmer went out to the barn to feed his cows and found all 25 lying dead. An autopsy found they'd all been electrocuted, yet their hooves were intact, showing that they hadn't been struck by lightning, which splits the hooves. The barn showed no sign of any damage.

Continued on page 7

LETTERS

From the Ham Shack

Ten-Tec, Inc. Rebuts

In October, we published "Where's the Manual?" by David Thompson K4JRB. We have just received this bulletin from **Scott E. Robbins W4PA**, Ten-Tec, Inc.'s Amateur Radio Product Manager:

"Mr. Thompson states 'Newer manufacturers only offer manuals for about three to five years after the product is obsolete ...' For Ten-Tec, this is not the case. We sell manuals for every piece of amateur radio equipment we have built, going back to when we first started manufacturing ham gear in 1968. We also service all gear ever manufactured by us, a claim no other transceiver manufacturer can make. We will continue to offer both manuals and service for all of our equipment, as we have done every day for the last 30 years."

That kind of reliability is increasingly rare these days ... Ed.

Les Oliver, Sacramento CA. Yes, I'm finally getting around to ordering some of your recommended books. Your editorials in *73* are always interesting, but, good grief, sir—you seem to try to encourage people to actually think. What an appalling concept! If too many people start to think and reason for themselves it could cause chaos. Just try to imagine what it would do to our political and educational systems alone (insert large, slightly sinister grin). On the subject of education, college was certainly interesting, but not particularly applicable to any portion of the real world which I've yet encountered. I worked in my original field for just over six months before deciding that I would wind up a *lot* crazier than I wanted to be. Since then I've built musical instrument amplifiers, done consulting, quality control, some time with Uncle "keeping the world safe from democracy," managed a steel fabrication mill, and am currently working in wholesale/retail sales of surplus electronics. As an aside, an Army psychologist once told me that the two career fields that I should *never* enter were sales and cooking. It's nice that I don't trust "experts," even iffen i are won. Enough aimless meandering. Keep up the good work.

Dr. Melvin Carlson, DDS N7RNG. I know you are interested in education, so permit me to contribute to your edification and challenge some of your statements in the October *73*. I can't say I was surprised by your shrill denunciation of fluorides. I have nothing against informed opinion, but I must remind you that misinformation not only refutes your point, but makes any other statements you make suspect. I'll be interested in laying my eyes on the study showing 480,000 children suffered a doubling of tooth decay while consuming the optimum amount of fluoride in their drinking water. I'd also like to see the documentation of the statement that an additional 60,000 people died of cancer as a result of optimum fluorides.

I am not aware of published evidence that 1 ppm causes severe allergic reactions and destruction of the immune cells. Obviously there are allergies that occur to any element in our environment, but to accuse anyone of hiding facts on fluoridation from the public borders on hysteria.

After practicing pediatric dentistry for almost 50 years I have personally witnessed the decline in tooth decay in kids to a remarkably low level. This reduction has occurred gradually since the introduction of fluorides in this country.

After reading your editorials I am amused, entertained and occasionally enlightened. If I knew as much about radio as I do about the benefits that fluorides provide, I would be as smart as you!

Thanks, Doc, but have you really done your homework, or have you bought the ADA party line, hook and sinker? For instance, a 1985-86 study of 39,207 American children aged 5 to 17 by the National Institute of Dental Research concluded that the children drinking fluoridated water have almost identical rates of tooth decay to those not drinking fluoridated water.

Dr. Whitaker's Health and Healing, *September 1997 issue, devotes over two pages to destroying the fluoridation myth. It also references a larger New Zealand study which reached a similar conclusion, and a 1987 Canadian study showed lower decay rates in provinces without fluoridated water.*

The report cites 11,000 calls per year to poison centers because children have ingested fluoridated toothpaste.

Japan and most of Europe have studied the situation and opted against fluoridation of their water supplies.

For a more complete report on the subject please read Fluoride, The Aging Factor, *which is reviewed in my* Guide to Books You're Crazy If You Don't Read. *The author, with whom I've corresponded, provides 46 pages of references to published papers. I've done my homework on this; now it's your turn to get busy. You can get more information from Citizens for Safe Drinking Water, 3243 Madrid St., San Diego CA 92110; (800) 728-3833. Also, when I wrote about it in my editorial I offered to make photocopies of three pages of references on the subject. A couple dozen readers requested them. Say, have you read the Procter & Gamble study of chromosome damage caused by fluoride? At 1/2 ppm they found 6% of the cells in the study had chromosome damage. Is that what you want for your kids? It seems that fluorides also disturb DNA repair and synthesis. ... Wayne.*

Louis M. Barrio KE6DKI. I really enjoy your column, "Never Say Die." It's provocative, controversial, and sometimes even humorous. Keep up the good work!

A recurring theme in your monthly column is how our hobby is fading away. I must give credit to Henry Ruh's article in the September '97 issue. His proposal for modifying the ham licensing structure is the first truly well thought out idea I've seen yet. While I think the requirements for license upgrading are a bit too stringent, overall he's right on target. Mr. Ruh's proposal would make hobbyists become active in the hobby and show real intent to upgrade. Upgrading would be an achievement- and learning-based process. This is, in my view, a better approach than the current system which encourages rote memorization and the learning of an archaic skill (Morse code) with virtually no use outside ham radio. What's more, it would give new hams an opportunity to get a real taste of what hamming is all about. Under Mr. Ruh's proposal there would be real incentive and opportunity to experience modes and bands beyond 2 m and 440 MHz. It would probably also encourage learning about antennas, electronics, propagation, and maybe even doing some kit building.

I think Mr. Ruh's proposal is far better than the alternative, that being arguing over preservation of the code requirement or lowering the required code speed, among other things. Meanwhile, our precious band allocations are being sold off or allocated to other uses and the ARRL (Archaic Radio Restoration League) sits and does little more than whine about the entire situation. When is the ham community going to awaken from its

NEVER SAY DIE

Continued from page 5

A later check with a Geiger counter showed high radiation where the cows had lain, and also where they were buried. And the following year the corn planted where the cows had been buried formed a perfect circle and turned brown and died when it was about six inches high.

More ETs

Put yourself in the position of an ET visiting Earth. The fact that you're able to visit the planet, which is thousands to millions of light years distant, guarantees that your technology is at least thousands of years ahead of ours on Earth. Suppose you could travel back 50,000 to 100,000 years and look at the civilization Earth had at that time. Would you land and look for a welcome from the people you find? At that time they hadn't even developed farming, much less towns or cities. And then, not too different from today, they were busy killing anyone who might be an enemy.

Well, it probably isn't much different for a civilization that's many millennia in advance of ours. So I suspect that many advanced races come here every now and then, take a look at how we're doing, maybe give us a little nudge, and that's that.

With some 50 billion solar systems in our galaxy, and with many probably having planets, since the same forces that form suns seem to also allow planets to form, and since most of 'em are a lot older than our solar system, the odds are that we're not hundreds or thousands, but perhaps millions of years behind millions of ET races. And that's just in *our* galaxy.

Considering all that, the surprising thing would be if we were not being visited by advanced races, and it would be more surprising still if they bothered to communicate more than with an occasional person, and they probably would erase any memory of that.

As a small Roswell note, the GAO, in 1995, tried to review the Army records of the Roswell Army Air Field and found that the pertinent records from 1946 to 1949 had all been destroyed—without authorization.

Roswell Echoes

If you are either brainwashed by the media or just not keeping up with events, the Col. Corso book, *The Day After Roswell*, written by an ex-top Pentagon official, claimed that he had seen an alien body, plus an Army autopsy report on the alien, and had been put in charge in the 1960s of integrating alien technology recovered from UFO crashes into our industries. Now another player from the 1947 era has come forth. The UFO (or more probably, two UFOs) crashed in July 1947 in New Mexico. By September of that year the first integration of the alien technology recovered from the crashes had already made its appearance.

This new chap, interviewed on the Art Bell W6OBB show, claims that the transistor was not invented by Shockley and his two pals at Bell Labs in Murray Hill (NJ), but was reverse-engineered by them from the UFO recovered artifacts. So much for their Nobel prize for the invention.

Further, this chap attributes the development of ICs, digital signal processing, lasers, modems, nuclear-powered engines, and imaging devices to the recovered alien technology.

Well, maybe the artifacts helped, but I was around when modems started and I don't recall any unexplained jumps in technology. Ditto ICs.

ICs were a natural development. When transistors made smaller circuits possible we first went to wired circuit boards, then to printed circuit boards, and finally to combining the transistors and circuits into integrated circuits, with each step shrinking the module size.

Heck, we were using RTTY modems in amateur radio in 1947. I got involved in 1949 and John Williams W2BFD had this technology well developed by then. Of course it took us a panel full of 6SN7GTs to do all of the work. I've still got a panel out in the barn that I built to connect my Model 12 Teletype machine to my ham rigs. I operated mostly on 2 m, but also made a bunch of 11 m contacts and even worked California on 80 m, back when the ARRL was still doing its best to keep FSK off the HF bands—worried that 60 wpm RTTY might put their CW traffic nets out of business.

The attribution to alien technology for our development of nuclear powered engines also doesn't make timeline sense to me. We developed the atom and hydrogen bombs in 1945, so we had a fair handle on nuclear power by 1947. And I haven't seen any hint that UFOs are nuclear powered anyway. Their powering technology seems to still be hundreds of years still ahead of us. Or more.

Any introduction of alien technology should be visible by sudden jumps in our technology, and most of our technologies have not shown such jumps. Except for transistors and fiber optics—although I was playing with glass filaments which I made in 1934, drawing out glass rods into long filaments. And I noticed how the glass allowed light to go through, even when it was bent. I had a lot of fun making tiny glass tubes by drawing out the Novocain tubes I got from a dentist friend.

There was no sudden jump in our move to digital communications. Our RTTY FSK signals were digital, with a start pulse, five data pulses, and a stop pulse. And that's not much different from ASCII, with its eight data pulses and an added parity

Continued on page 81

---

current stupor and realize the time to act is *now*? We can save our hobby. I think the first step is to get behind constructive proposals like Mr. Ruh's and get the FCC and the ARRL to act on them. So OK, Mr. Ruh's proposal isn't perfect, but with some modification, and more importantly its adoption, hams would be taking a giant leap forward in saving our grand old hobby!

Ozzie Levin W5RK. I met you in Chicago way back in the 1930s at a ham convention. I have followed your career and subscribed to your *73* magazine and read all your editorials and enjoy them immensely. I have been a ham for over 60 years, but believe me I am in complete agreement with you on eliminating the code. We should do everything within our power to overturn this detrimental portion of the ham exams. I have taught ham radio classes for over 40 years, both at the local high school and my home. I am proud to say that I have turned out a large number of hams who have gone into the electronics industry as teachers, engineers, etc. Like you I have an inquiring mind. Having worked with pyramids, the Hieronymous machine, and built my own version using transistors, I also found the battery could be disconnected and it would still work, and by the way, after experimenting with pyramids, trying to find out what made them work, I discovered that they are affected by sunspot activity. During this low cycle experiments do not always work. I built most of the mind machines you mentioned in your last issue and they all work. So, to the scientific community and the rest of the doubting Thomases, you'll never know and that's too bad. There are many things in this world of ours that we cannot perceive with our five senses. Wayne, just wanted to say thanks for all your editorials and insight into things not necessarily related to ham radio. 73

QRX . . .

Which Form Was That?

The FCC has released a new Form 610, dated March 1997, which, among other minor changes, includes a space for your E-mail address. The form is available via the FCC's Internet site or through normal channels.

The Environmental Impact question has become a statement in which the applicant certifies that "the construction of the station would not be an action which is likely to have a significant environmental effect." According to the Gettysburg FCC office, they will continue to accept the three different Form 610s (dated Nov. 1993, Mar. 1995, and Mar. 1997) until further notice.

From *The Modulator*, newsletter of the Fort Myers (FL) ARC, September 1997.

Students Have Radio Link to Space

Augusta, ME: Augusta schoolchildren will talk to astronauts passing hundreds of miles overhead in the next few years, thanks to a five-year collaboration between schools and local amateur radio enthusiasts.

Cony High School teacher David Garippa hopes that three to five minutes of communication will open the eyes of students to the power of the rapidly growing world of communication technology.

From Cony's communication room—a small second-floor room packed with radio equipment and computer monitors—students can communicate with amateur radio operators anywhere in the world, or track the movement of satellites with equipment that has largely been donated.

Garippa said the effort started with the idea of putting the latest technology into the hands of students.

"We want to provide Augusta kids and adults—whoever wants to use it—with a place where they can learn new communication technology," said Garippa. "Communication technology is one of the most important and fast-moving technologies in the world."

Beginning in 1992, community sponsors, including the Augusta Amateur Radio Club, have donated radios, antennas, and the expertise to teach students how to use the equipment.

One computer in the communication room tracks the positions of satellites and shows students the view from the satellite's "back window," or space side.

A digital packet radio donated by the club allows students to connect to the space shuttle.

Recently, one of Garippa's classes used that radio to listen to a transmission from the Russian space station *Mir*, and heard a visiting American astronaut discuss the experiments of the day.

"We are trying to give something to the community—give the kids something to do that is constructive and pay back the community," said Richard Beausoleil.

Beausoleil, president of the Augusta Amateur Radio Club, said amateur radio not only provides an academic component, but also gives young people a chance to play an active role in the world around them. In times of emergency, amateur radio operators can perform vital tasks.

For example, when floods wiped out all normal communication recently in Grand Forks, North Dakota, ham radio operators provided emergency communications, and even dispatched for the fire department, he said.

"It teaches them digital communications and also it fine tunes their computer skills," Beausoleil said. "And it is fun."

Paul LeClair, a member of the radio club, applied to SAREX, the Shuttle Amateur Radio Experiment, on behalf of Cony in the fall of 1996, according to Garippa. The application was accepted in February 1997.

Since 1992, the AARC has donated equipment to the school and instructed students in its use. "We wanted to take them on," said LeClair. "We wanted to take them under our wings. You have got to have good radio gear. You have got to have good antennas and you have got to have, hopefully, a room full of kids," LeClair added.

Garippa said he hopes to make the link-up a citywide event.

Students from any school in the city, including private schools, can participate, according to Garippa, although strict time limits will be enforced because of the short amount of time when the shuttle will be in range.

Cony is now offering a class for amateur radio licensing.

From an article by Alan Crowell, in *The Kennebec Journal*, May 31, 1997.

Transceiver Ad Translations

ADVANCED DESIGN: Upper management doesn't understand it.

ALL NEW: The plugs, jacks, and connectors aren't compatible with anything else on the market.

BREAKTHROUGH: We ignored everything we learned in developing the previous design.

CUTTING-EDGE TECHNOLOGY: Designed around a bunch of free samples from a salesman. He claims the production units will work just like the samples.

DESIGN SIMPLICITY: It was developed on a shoestring budget.

ENERGY EFFICIENT: Almost unmeasurable power output—you'll need a linear to work anyone but your next-door neighbor.

EXCLUSIVE: We're the only ones who have the documentation.

FIELD TESTED: Manufacturing doesn't have a test system.

FOOLPROOF OPERATION: We eliminated almost all of the controls.

FUTURISTIC DESIGN: The mold for the plastic case got screwed up—that's why it looks so weird.

HIGH ACCURACY: But the display only shows three significant digits to keep the cost down.

ISO-9000 CERTIFIED: We have *no* idea what this means, but our competitors claim they meet it, so we probably do, too.

IT'S HERE AT LAST: We've released a 26-week project in 48 weeks.

MAINTENANCE FREE: It's impossible to fix.

MEETS QUALITY STANDARDS: The on/off switch almost never breaks. We haven't checked the rest of it yet.

MIL-SPEC: From the folks who brought you $600 toilet seats.

MODERN SUPPLIERS: The IC in the RF output stage is available solely from a supplier in Bangladesh.

NEW: It comes in different colors than the previous version.

PERFORMANCE PROVEN: The breadboard worked really neat.

REVOLUTIONARY: The knobs go round and round.

SATISFACTION GUARANTEED: We'll send you a replacement unit if you don't like it.

STOCK ITEM: We shipped it once before, and we can do it again, probably.

UNMATCHED: It's almost as good as the competition.

UNPRECEDENTED PERFORMANCE: Nothing ever had as many out-of-band harmonics as this unit.

YEARS OF DEVELOPMENT: We finally got one to work.

TNX to *ARNS Bulletin*, September 1997.

Substitute in Space

Astronaut Andy Thomas is studying for his ham ticket in anticipation of spending several months aboard the Russian *Mir* space station starting in January 1998. He'll replace Wendy Lawrence KC5KII in the *Mir* rotation. Lawrence was originally supposed to replace Mike Foale KB5UAC aboard *Mir* in the autumn of 1997 but in the wake of the problems aboard the space station over the past few months, however, NASA determined it would prefer to have an astronaut aboard *Mir* who could fit the Russian space suits—in case an astronaut needed to participate in a space

walk as Foale had to do during his *Mir* stay. Lawrence is too small to wear the Russian space gear, and that same thinking could have been behind swapping Thomas for Lawrence on the subsequent *Mir* posting.

Thomas, a native of Australia, is 45 and single. He holds a Ph.D. in mechanical engineering, and he became an astronaut in 1993; his first space flight was aboard *Endeavour* in May, 1996.

From an article in *Badger State Smoke Signals*, October 1997.

Extra Certificates Discontinued

The Amateur Extra Class certificate that has been available through the ARRL Awards Branch has been discontinued. However, some stock remains, and applications will be accepted while blank certificates last. Send a copy of your Amateur Extra license and a check for $5 to: ARRL Awards, 225 Main Street, Newington CT 06111.

TNX Chuck Hutchinson K8CH; from *Badger State Smoke Signals*, October 1997.

The Dr. Is Destinated: More Questions & Answers for the New Ham

Q. I don't have a tape player or computer, but I do have a VCR. Short of listening on the air, what's the best way to learn CW?

A. Short of listening on the air, what do you want to learn CW for? But seriously, *QST* would probably tell you to use your VCR to make a pirate (stolen) copy of your friend's Morse tapes. We say why steal a copy of the tapes? Just go ahead and steal everything he's got.

Q. I have a 486 computer that used to be a 386. Now it locks up after a few minutes and I have to turn it off and wait for a while. What's wrong with it?

A. Looks to me like you may have written to the wrong magazine.

Q. Why can't I call "CQ" on the repeater?

A. That question is not as dumb as it sounds, because there are lots of new hams who don't know the first thing about hamming. You use your two-meter ham to call the repeater right? CQ is for HF, so if you call CQ on the repeater, a lot of HF stations will answer. Unfortunately, you will not be able to hear them because they are using their HF ham which is incompatible with your two-meter. You will have much more success if you ask whether anyone has their ears on, or if anybody has got a copy.

Q. If radio waves travel like light, how come the radio works at night when light doesn't work at all except for the moon and such?

A. Beats me. Probably you are just hearing radio signals that are left over from the daytime. There is a theory called Transverse Temporal Gray Line Ducting which says that since radio waves travel at the speed of light, they can borrow time from tomorrow, sometimes. That would probably explain it.

Q. I've been wondering, just what are you a doctor *of*?

A. In the interests of confidentiality and privacy, my identity and credentials have been withheld. Suffice it to say that I am just as much a doctor as you are a ham.

Q. Am I the tallest ham in the world? And why is it important? Every day I hear guys talking about how tall they are, and most of them are like 5-5 or so, and I never heard of one that was taller than 5-9. I'm 6-3 but they STILL say I'm 5-9. What's the story?

A. In the olden days, hams used to believe in a thing called a Code of Conduct. One of the provisions of the Code that is still practiced by many is that "The ham is modest. He does not brag on the air." That's why you often hear guys say things like, "I'm only running a kW," when in fact they are running 3 kW. You shouldn't brag about your height any more than you should brag about your equipment. As for why it is important, the way your HT hits the repeater is directly proportional to the distance between your mouth and the ground, which is in turn related to your height. But do keep in mind, it's not the height or width or length of your equipment: It's how you use it.

Q. Last month you made a joke at the expense of a person who was asking a serious question. I think that's rude. I thought hams were supposed to be polite.

A. Only on the air. Get lost.

Q. I'd like to get myself a new ham. What is the very best one to get? Should I get a two-meter ham or one that has more meters?

A. Different people will tell you different things, but I will tell you this: The absolute very best rig you could possibly get would be the Colorado QRP Club's "QRPpp Special." It works equally well on all bands, and the CQC actually guarantees that you will be able to talk to everyone in the world who wants to talk to you. By the way, we usually say rig instead of ham. Rig is easy to remember because it also means truck. Ham is more commonly used to mean your ticket, which also has a trucking connotation. [Ed. Note: The "QRPpp Special" is a wooden HT awarded to a member for a "conspicuous foul-up," and is guaranteed legal on all bands.]

The Doctor will answer the most interesting questions from readers. Questions may be edited for length and clarity, which is why many of them disappear altogether. Address your questions to The Doctor, in care of this publication.

Author anonymous; TNX *Low Down*, official journal of the Colorado QRP Club [cqc@aol.com].

Repeater vs. Repeater vs. FCC

One repeater group that says another repeater is interfering with its system has filed a petition with the FCC for the issuance of a "show cause" order aimed at getting the alleged interferer off the air. The Monmouth County Repeater Association of Asbury Park, New Jersey, says that the issue is that of codifying amateur radio repeater coordination and the right to operate a coordinated repeater free of interference from an uncoordinated one.

The Monmouth group operates 2m system WB2ABT on 146.645 out. Another group, called SPARK and located in Bangor, Pennsylvania, uses the same frequency pair for WA3MDP about 100 miles away. Each is serviced by a different coordinating body, although Monmouth contends that SPARK is uncoordinated—which SPARK disputes.

In December 1996, the FCC ordered SPARK off the air. Their response was to request an investigation into whether the Monmouth group and its coordinator had conspired to misrepresent facts to the Commission.

Monmouth raised the stakes by hiring Washington communications attorney John McVeigh KD4VS. In addition to the show cause request, McVeigh has asked the FCC to rule on two other important issues: Does volunteer coordination hold any legal standing? And, Will the Commission enforce its rule that the burden of responsibility for clearing up interference between a coordinated and an uncoordinated machine lies with the latter?

So, in essence, the MCRA is taking the role that you would think the National Frequency Coordination Council or the ARRL would assume, in trying to get the Commission to state, once and for all, unambiguously, whether there is a need for repeater frequency coordination in the ARS.

No matter what the FCC decision, this small club in New Jersey has positioned itself as the *de facto* single point of contact on repeater matters, at least as far as the FCC is concerned. That sets a precedent that one day will affect the day-to-day operation of every repeater in the United States.

Many thanks to *X-Mitter*, newsletter of the Penn Wireless Association, October 1997.

Get Active!

A nice amp project for building your own active antenna.

Parker R. Cope W2GOM/7
8040 E. Tranquil Blvd.
Prescott Valley AZ 86314

An antenna of any kind, passive or active, is a conductor (radiator) immersed in an electromagnetic (EM) field that converts the intercepted EM radiation to a voltage or current that can be used by the receiver. A passive antenna is just the radiator; an active antenna is a radiator plus transistor(s) and other circuitry that matches the radiator to the load.

Electromagnetic fields are described in terms of volts or amps per meter, so the dimensions of the antenna determine the volts or amps that appear at its terminals. To confound the issue, the antenna's dimensions relative to a wavelength also determine the impedance of the source of voltage or current. The impedance of the antenna is resistive (resonant) only for particular lengths. The longer the antenna, the higher the maximum available power output, but for some dimensions it is very difficult to obtain the power that is available. For example, a full-wave dipole has a high impedance that is difficult to match. In short, bigger is better—but with reservations.

When we are stuck with a small antenna, we can't afford to waste any of those precious few microvolts of signal because of mismatch. We want and need them all. The active antenna described in the following paragraphs losslessly matches a short antenna to the receiver. Its output is only 18 dB less than a full-sized half-wave horizontal or quarter-wave vertical antenna. The theory and design equations are given so that the effects of a particular situation can be understood and to allow the circuit to be adapted to use the components available.

The maximum available power from any source is obtained when the load presents a conjugate match to the source. The maximum voltage from a source is produced across an open circuit even though no power is delivered to an open circuit. A conjugate match occurs when the impedance of the load equals the impedance of the source with phase shifted 180°. That is, the resistive part of the load impedance equals the resistive part of the source's impedance and the reactive part of the load impedance equals the reactive part of the source's impedance—but with opposite sign. With opposite sign reactances, the net reactance is zero and the circuit is resonant. To realize an open circuit requires the reactance to be resonated and the resistance across a parallel resonant circuit to be infinite.

A short antenna, one that is a small fraction of a wavelength, has a resistive part that is small and a reactive part that is high. For example, a short centerfed dipole has a radiation resistance of:

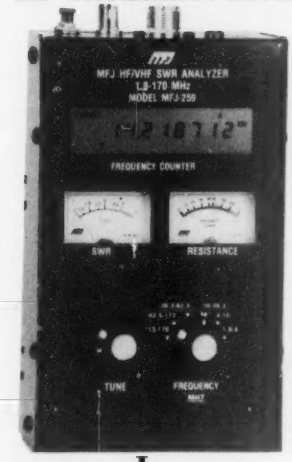
$$R = 20\pi^2(L/\lambda)^2 = 197(L/\lambda)^2$$

where L = the length of a very short centerfed dipole
and λ = the wavelength, in the same units as L.

A six-foot vertical whip over perfect ground is equivalent to a twelve-foot dipole. At 7 MHz, a six-foot whip has a radiation resistance of about 1.4 ohms. At 3.5 MHz, the radiation resistance drops to 0.35 ohms. The reactance of a vertical six-foot whip made of #8 AWG (0.125" diameter) wire with the bottom located a foot or so above ground looks like 15 or 16 pF. The capacitance of a six-foot vertical made with #24 AWG (0.02" diameter) wire looks like 12 or 13 pF. The capacitance is dependent only on the physical dimensions of the antenna, its

MFJ *HF/VHF* SWR Analyzer™ with RF Resistance Meter

Read your antenna SWR from 1.8-170 MHz . . . 10-digit LCD frequency counter . . . RF Resistance Meter™ . . . smooth reduction-drive tuning . . . simple-to-use . . .



MFJ-259 **$239.95** If you work with antennas, MFJ's revolutionary new *SWR Analyzer™* is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

What the MFJ-259 Does

The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? *The new MFJ-259 tells you at a glance!*

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss.Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter™* and an *SWR Analyzer™*.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! **For** free manual write or call MFJ.

Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. It's in a rugged all metal cabinet that's a compact 4x2½x6¾ inches. Take it to remote sites, up towers, on DX-peditions -- anywhere your antennas are located.

For rough service, pick up a convenient **MFJ-29B**, $24.95, padded carrying pouch to keep your MFJ-259 close at hand and looking like new.

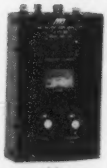
How Good is the MFJ-259?

MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installers and technicians use them worldwide.

Get More by Paying Less

With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter™*-- all for a low $239.95.

1.8-170 MHz *SWR Analyzers™*



MFJ-249 **$219.95** **MFJ-249** *HF/VHF SWR Analyzer™*. Same as MFJ-259 but less RF resistance meter. Includes 10-digit LCD frequency counter, *full* 1.8-170 MHz coverage and smooth vernier tuning.

MFJ-209 **$109.95** **MFJ-209** *HF/VHF SWR Analyzer™* is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter, smooth vernier tuning.

Carrying Pouch with Window

MFJ-29B **$24.95** **Tote** your MFJ-259 /249/209 *SWR Analyzer™* anywhere with this custom Carrying Pouch. Made with a special foam-filled fabric, it cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Clear protective frequency display and window cutouts for knobs let you use it without taking it out of pouch. Fully adjustable webbed fabric carrying strap has snap hooks on both ends. Wear around waist or over shoulder.

Keep your analyzer safe and looking new! **MFJ-29**, $19.95, no window or cutouts.

Dip Meter Adapter

MFJ-66 **$19.95** **Plug** a dip meter coupling coil into your *MFJ SWR Analyzer™* and turn it into a sensitive and accurate bandswitched dip meter.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits and measure Q of coils. Set of two coils cover 1.8-170 MHz depending on your *MFJ SWR Analyzer™*.

440 MHz *SWR Analyzer™*

MFJ-219 **$99.95** **Read** SWR of any antenna 420 to 450 MHz -- just plug coax of your antenna into SO-239 connector, set frequency and read SWR. Uses microwave integrated circuits and microstrip technology. Jack for external frequency counter. 7½x2½x2¼ in.

MFJ-219N, $99.95, sames as MFJ-219 but with "N" connector.

MFJ-219 uses 9 volt battery or 110 VAC with MFJ-1312B, $12.95.

MFJ 2 Meter *FM SignalAnalyzer™*

Measure signal strength over 60dB range - Check and set FM deviation - Measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB - Analyze audio quality with scope

NEW! MFJ-224 **$159.95**

MFJ's revolutionary handheld 2 Meter *FM SignalAnalyzer™* lets you measure signal strength with over 60 dB dynamic range; check and set FM deviation of your packet and voice radios; measure antenna gain, beamwidth, front-to-back ratio, sidelobe suppression and actual feedline loss in dB.

Plug in any scope and your MFJ *FM SignalAnalyzer™* becomes a service monitor! It lets you visually analyze modulation wave forms, measure audio distortion, noise and instantaneous-peak deviation.

You can tune in any signal between 143.5 and 148.5 MHz. It's built-in discriminator-meter function makes accurate tuning simple and easy.

You can plug in headphones to help you tune in and identify signals easily. There's also a battery check function. Uses 9 volt battery. Measures 4x2½x6¾ inches.

Here are some countless jobs your MFJ *FM SignalAnalyzer™* can perform . . . evaluate antenna performance, detect feedline faults, plot field strength patterns, position your antennas, measure preamp gain, track down hidden transmitters, check and set deviation, analyze audio quality, scan the band, tune transmitters and filters, and much more!

The MFJ-224 2 Meter *FM SignalAnalyzer™* may be the most useful 2 Meter handheld test instrument you may ever own.

Free MFJ Catalog

and Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

• 1 year **unconditional** guarantee •30 day money back guarantee (less s/h) on orders from MFJ • **FREE** catalog

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (601) 323-6551; **Add s/h**
Tech Help: (601) 323-0549

MFJ . . . the world leader in ham radio accessories!

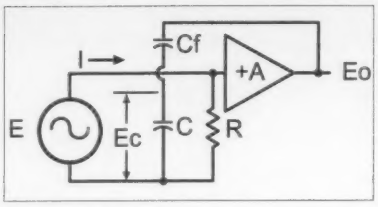


Fig. 1. A negative capacity can be generated.

diameter and length, and its proximity to grounded objects. The capacitance is independent of frequency but the reactance varies inversely with frequency:

$$-jXc = 1/(2\pi fC)$$

At 7 MHz, 15 pF has a reactance of about -j1500 ohms; at 3.5 MHz, the reactance is about -j3000 ohms. The impedance of the six-foot whip at 7 MHz is 1.4-j1500, 1500∠-89.95° in polar form. A conjugate load at 7 MHz has an impedance of 1500∠+89.95°, which is equivalent to 1.6 MΩ in parallel with +j1500.

Converting from impedance to admittance can be laborious. However, if the ratio of resistance to reactance, or reactance to resistance, is 50 or greater, the smaller term can be neglected: 1.4-j1500 is essentially -j1500 or 1500∠-90° and resonates with +j1500. In theory, an inductor could produce a reactance of +j1500 but a practical one has a significant and unavoidable resistance. An inductor also must be variable to resonate the varying capacitive reactance. +j1500 can be obtained with a negative 15 pF and its reactance varies along with the antenna's reactance.

A negative capacitor is not something to be bought at the local electronic parts store, but it is something that can be generated with a simple circuit that uses commonly available parts. The conceptual circuit shown in **Fig. 1** generates a negative capacitor. The resistor R represents the input conductance of the amplifier and losses in the circuit board; C is the sum of the antenna's capacity, the input capacity of the amplifier, and stray circuit capacity. C_f provides feedback from the amplifier's output to the input. The amplifier has a voltage gain of +A, as the output is in phase with the input.

The generation of a negative capacity can be followed with **Fig. 1**: When the junction of C and C_f is disconnected from the input, the signal current I flows only into R and the voltage E at the input to the amplifier is IR. The output of the amplifier E_o is AE and the voltage E_c appears at the junction of C and C_f. If C_f is chosen so that $E_c = E$, then when the junction of C and C_f is reconnected to the input terminal, no current flows from the signal source into these capacitors and the effect of C is removed. C_f and the amplifier produce a negative capacitor that is equal to C:

$$-C = C_f(A-1)$$
Equation 1

The negative capacity generated is dependent only on A and C_f.

A practical non-inverting amplifier is shown in **Fig. 2**. The gain is determined by the ratio of R_c to R_s and the voltage gain of the source follower VG_{sf}.

$$A = VG_{sf}(1+R_c/R_s)$$
Equation 2

VG_{sf} is the voltage gain from the gate to the source of Q1. A source follower is often assumed to have a gain of unity but, in fact, it is always somewhat less than unity. The gain depends on the value of R_s and the effective transconductance G_m of the amplifier. The effective transconductance is the change in current in R_s for a change in gate voltage. Since the base current of Q2 is the drain current of Q1, and collector current is $I_B h_{fe}$, $G_m = g_{fs} h_{FE}$. Only when $G_m R_s$ is much greater than one does the gain approach unity. The voltage gain of the source follower can be expressed as:

$$VG_{sf} = G_m R_s/(G_m R_s+1)$$
Equation 3

R_s and I_c determine the DC operating point of the amplifier, $V_{gs} = I_c R_s$. The negative feedback provided by R_s stabilizes the operating point of the amplifier and makes the amplifier immune to changes in supply voltage as well as tolerant of the characteristics of the transistors. If a change were to increase I_c, V_{gs} would increase, which would decrease I_D, which would decrease I_c. The negative feedback reduces the output impedance, reduces the input capacitance of the Q1, and increases the output bandwidth.

The relationship of the JFET's parameters are given by Evans in *Designing With Field-effect Transistors:*

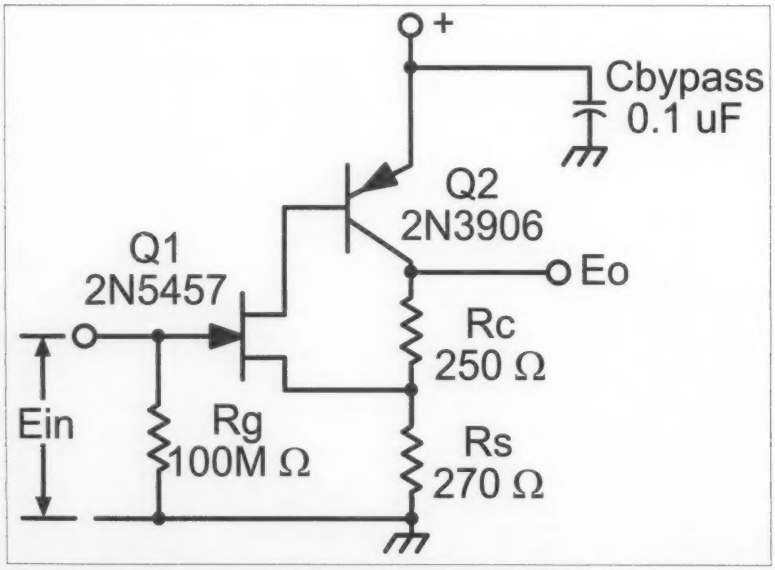


Fig. 2. A practical non-inverting RF amplifier can be very stable.

$I_D = I_{DSS}(1-V_{gs}/V_{off})^2$
$g_{fs} = 2I_D/(V_{gs}-V_{off})$

The DC operating conditions of the transistors in the amplifier shown in **Figs. 2** and **3** are: I_D = 50 uA at V_{gs} = 2.66, g_{fs} = 2.5 x 10-4, I_c = 10 mA, h_{fe} = 200 at I_c = 10 mA. The effective transconductance is:

$G_m = 2.5 \times 10^{-4} \times 200 = 0.05$ S.

The negative capacity generator shown in **Fig. 3** shows the receiver's input resistance shunting R_s. The resulting RF value of R_s is R_{srf}. When the receiver's antenna input impedance is 50 Ω, R_{srf} is about 42 Ω and VG_{sf} is about 0.68. However, if the receiver's input impedance changes with frequency, then the negative capacitance also changes. When the negative capacity is excessive, the net capacitance at the gate of Q1 is negative and the circuit will oscillate at the frequency at which the vertical radiator is approximately a half-wave long.

In **Fig. 3**, the value of C is assumed to be 30 pF, which is composed of the antenna's 16 pF, the amplifier's 2 pF input capacitance, and 12 pF circuit strays—for a total of 30 pF. The negative feedback provided by R_{srf} reduces the input capacitance of Q1. C_f is arbitrarily chosen to be 15 pF. With **Equation 1** the amplifier gain needed to generate -30 pF when C_f is 15 pF is 3. The uncertainty of the antenna's capacitance, strays, and component tolerances and the receiver's antenna input impedance suggests that the negative capacity be variable. The negative capacity can be varied by changing either C_f or the amplifier's gain. Because variable capacitors are relatively difficult to obtain, C_f is selected to be fixed and the gain is varied by changing R_c. **Equation 2** shows that when R_c is composed of a 250 Ω variable plus 82 Ω fixed, the amplifier gain can be varied from 2 to 6 and the generated negative capacity varied from 15 pF to 75 pF. The power dissipation in R_c is less than a milliwatt, so any variable carbon or cermet pot can be used. A wirewound variable resistor should not be used, because its inductance increases the collector impedance with frequency and causes the negative capacity generated to change with frequency.

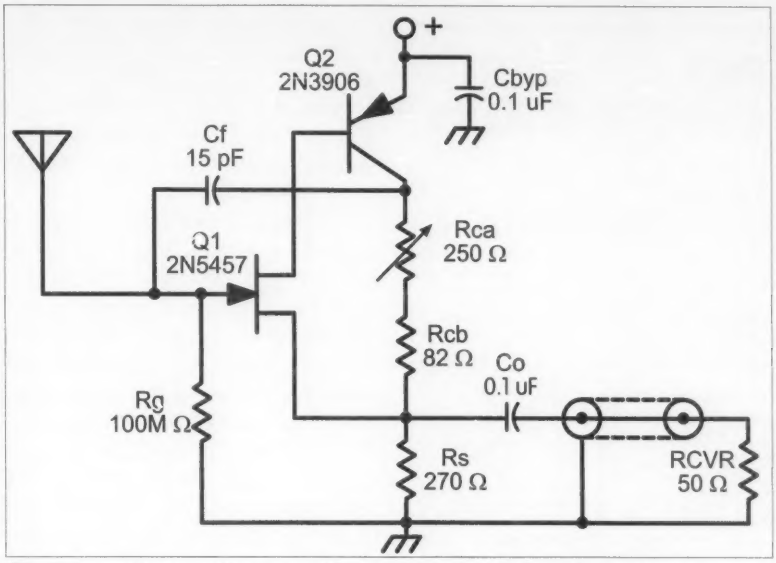


Fig. 3. A negative capacity can provide a conjugate match for a short antenna.

While the maximum available power is obtained with a matched load, the maximum voltage is developed across an open circuit. The active antenna's negative capacity generator presents an open circuit to the antenna's terminals. The negative capacity cancels the antenna's capacity—it resonates the antenna's capacitance. The gate of Q1 looks like an extremely large resistor. The DC gate return resistance R_g can be hundreds of megohms because the gate current of the 2N5457 is a fraction of a nanoamp. The leakage across the circuit board or a pencil track on the circuit board can provide the high resistance R_g.

The negative capacitv generator can be built on perfboaid mounted in something like a minibox. The whip radiator should be connected directly to the gate of Q1. Even a short piece of transmission line between the whip and the negative capacity generator

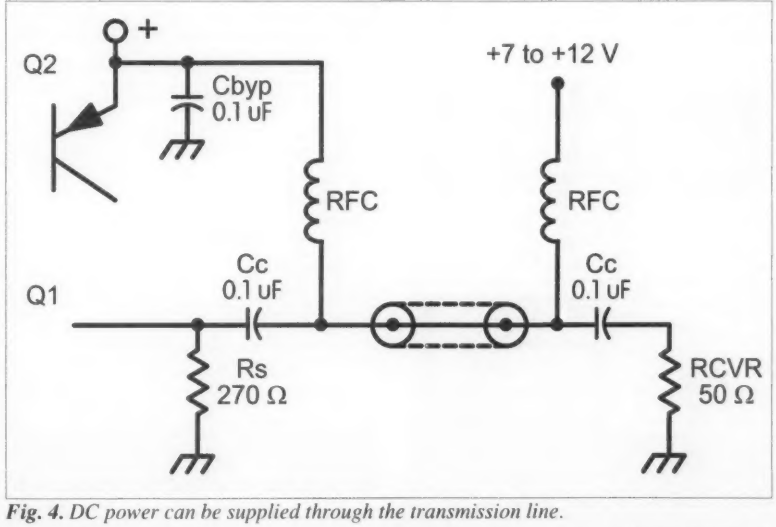


Fig. 4. DC power can be supplied through the transmission line.

just adds capacity that must be canceled and should be avoided. A banana jack makes a good entry connector for the whip. It probably goes without saying, but if the active antenna is to be located outside it should be sealed against the weather.

The power supply for the negative capacitor generator is not critical—anything from 7 V to 24 V will do. The current drawn is about 10 mA, so the life of a battery would not be particularly long. But 10 mA can probably be stolen from the receiver without ill effects. **Fig. 4** shows how DC from the receiver or other remote source can be fed to the active antenna through the transmission line. The separation between the antenna and the receiver can be virtually any distance. The RF chokes in **Fig. 4** can be any inductance that has a reactance of more than 500 Ω at the lowest frequency of interest. The inductance L can be found with the following equation:

$$L = 500/2\pi f = 250/\pi f$$

where L is in henrys
and f is the lowest frequency of operation in Hertz.

If the supply voltage is high enough, the RF chokes can be replaced with resistors. (The voltage drop across the two 470 Ω resistors will be about 9.4 V.) Since the voltage at the emitter of Q2 should be at least 7 V, the supply voltage should be greater than 9.4 V + 7 V = 16.4 V when resistors are used.

The adjustment of R_c is straightforward and only needs to be changed when the antenna is moved or changed: Start with R_c set at minimum, tune the receiver to a convenient frequency someplace in the 80 or 40 meter bands, and adjust R_c for the greatest output. The receiver doesn't need to be tuned to a station, because the man-made noise intercepted by the antenna will surely override the receiver's internal noise. If the receiver has an S-meter or other tuning indicator, this can be used to indicate the maximum signal strength. Of course, it can also be done just by listening.

The receiver's input resistance has been assumed to be 50 Ω, but it may vary with frequency. If this is the case, the negative capacity will change with tuning. When the gain is excessive, the total capacity at the gate of Q1 will be negative and the circuit will oscillate at the frequency where the antenna is a half-wave long. If the receiver's input varies with frequency, adjust R_c for optimum at the frequency that has the highest receiver input resistance. The match will not be perfect at other frequencies but that's the trade-off between peak performance and adjustment-free performance.

The improvement over just a short antenna connected to the receiver is amazing. When the antenna impedance is 1500 ohms, the voltage applied to a 50-ohm receiver suffers a 30:1 loss (29.5 dB). And this loss is to a signal that is already small: A six-foot whip has an open circuit output that is about 1/6 (15.5 dB) the output of a quarter-wave vertical just by virtue of the different lengths. These two losses stack up to a 45 dB penalty imposed by an unmatched six-foot vertical. At lower frequencies, it is even worse. Is it any wonder why short antennas are the very last choice?

With the active antenna described here, a six-foot whip does a reasonable job in the shortwave bands. Not as good a one as a full-sized quarter-wave vertical, but then again, it can fit on the wall and probably cost under $10—and you certainly can't say *that* for a full-sized vertical. 73

Upgrading the 209

Add this simple resistance meter to your MFJ antenna analyzer.

Mike Walker KG5CM
11102 Sharpview
Houston TX 77072

Once I used a borrowed MFJ-259 antenna analyzer, I knew I had to have one. It was a terrific little unit that did everything advertised. For hams not familiar with it, the 259 is a signal generator with a frequency counter and a return loss bridge all in one box. You can tune antennas and tuners, adjust tuning stubs, use it as a grid-dip meter (with optional coils), and do other wondrous things as well. It even tells the impedance of a circuit, which is handy. If the SWR meter reads 2:1 SWR, you can see whether the impedance is 25 or 100 ohms.

One minor problem turned up while N5YTN and I were adjusting his six- and two-meter beams: the last three digits of the frequency counter kept bouncing around. It was more an annoyance than a real problem, but it was distracting.

K.I.S.S.

My ham budget is meager, so I started saving up for my own 259. It seemed like every time I got close to the $239 required for the analyzer, something trivial would come up. I don't like to walk to work, so I bought tires, a water pump, etc. You know the drill.

The whole time this was going on, I was thinking about the pocket-sized frequency counter I already owned. It's the Radio Shack™ 22-305, which reads to 1.3 gigs.

Now I became the frugal ham. The MFJ-209, with a jack on it for an external frequency counter, is around $100. I could get a 209, and all it would lack is the resistance meter. I read in the MFJ literature that the 209 and 259 units are identical—there are just fewer "bells and whistles" on the lower-priced unit. In less than four days, I had a shiny new MFJ-209.

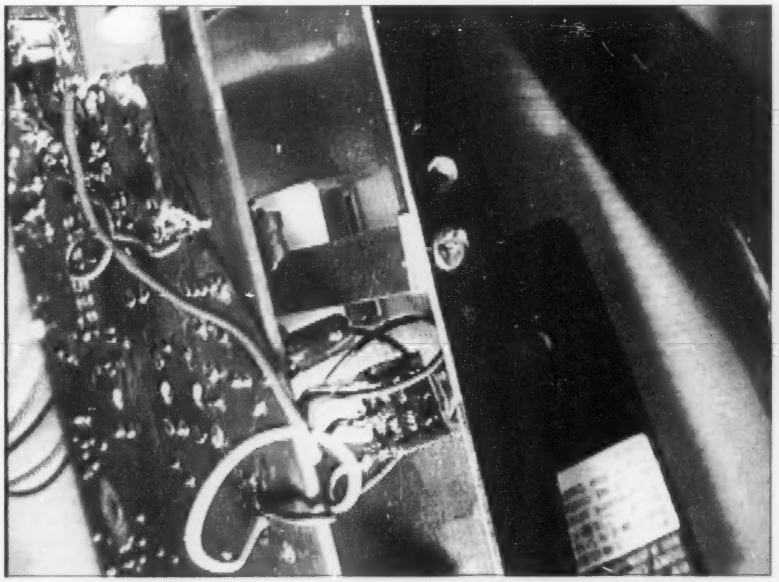


Photo A. *Side view of analyzer showing trimpot and momentary switch. Photos by Otto Barsch.*

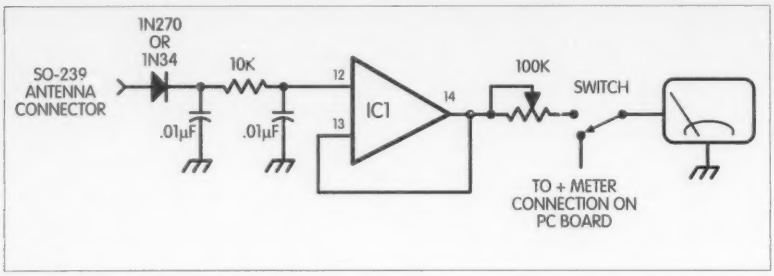


Fig. 1. Basic resistance meter circuit.

Qty.	Part
2	.01 μ F 50 VDC capacitor
1	1N270 or 1N34 Germanium diode
1	10 kΩ 1/4 W or 1/2 W resistor
1	100 kΩ 1/4 W trimmer potentiometer
1	SPDT momentary contact push-button switch

Table 1. Parts list.

The 209 worked like its big brother, at less than half the price. The best part was that the frequency readout on the Radio Shack counter was solid as a rock. Just dial up a frequency, and boom! You know you're there.

Now I decided I needed a resistance meter. I thought about adding a bar graph display, because there simply was not enough room to mount another meter on the case. After a few days of contemplating one method and another, I decided simple is best. Just like already owning a frequency counter. Well, the 209 already had a meter built in.

By adding an SPDT momentary-contact switch, the meter could serve a dual purpose. I recommend using a momentary-contact switch because I could just see myself whacking at a dipole until the SWR meter read as low as possible, then finding I had the unit in the *resistance mode!* You can bet a few new words might be inspired by that error.

Construction

The modification is simple. All it takes is the switch, a germanium diode, a trimmer potentiometer, two capacitors, and a resistor. The whole job takes about an hour.

Remove the back of the MFJ-209. Connect the anode of a 1N34 or 1N270 diode to the center pin on the antenna connector. Make the lead short, 1/8-inch or so, since the device can be used at VHF frequencies. With the base of the unit towards you and antenna connector away from you, the diode should lead off to the lower right from the SO-239 center pin.

Scratch the paint off the ground plane of the PC board, in a square area about 1/4-inch on a side, directly beneath the cathode lead of the diode. Solder one side of a .01 μF cap to the ground plane. Make the ground lead as short as possible. Mount the cap vertically and attach the other leg of the cap to the cathode of the diode, again with short leads.

Now attach a 10 kΩ, 1/4-watt resistor to the cap/cathode connection and solder. This is dead-bug-type construction and it works well here. Now scratch the paint off the ground plane under the end of the resistor that is floating in the air. Add another .01 μF cap from the resistor to ground. You have just completed the detector portion of the resistance metering circuit!

The signal from the detector must be buffered to operate the meter. Fortunately, there is one unused section on the quad op-amp used in this unit.

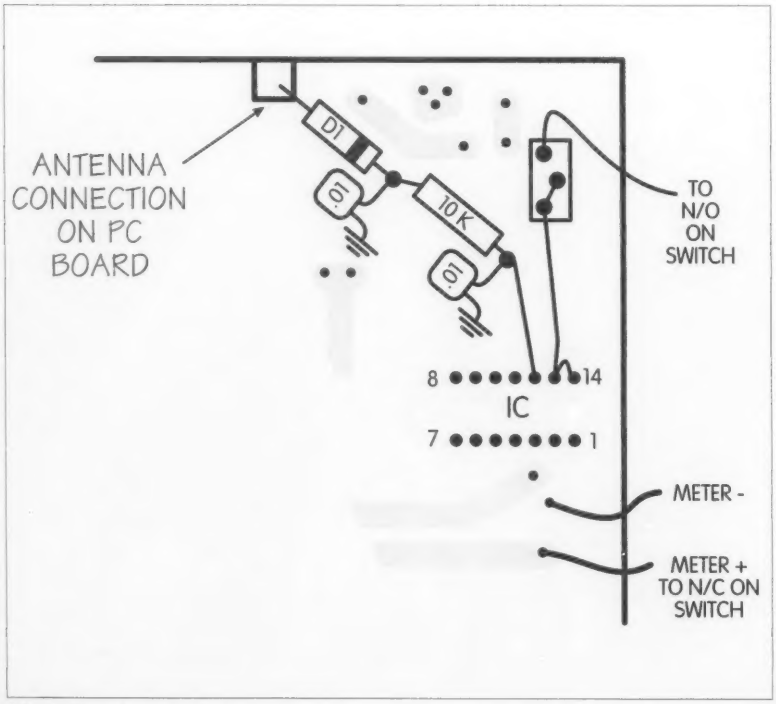


Fig. 2. Board connections.

The pins of the IC socket have no foil pads around them, so you must solder directly to the pins.

I use a 55-watt iron with a 1/8-inch tip. This iron is quite hot and you can get on and off a connection quickly. At the very least, have a good clean tip—that will help in making a good solder connection to the ground plane in the detector wiring.

If your resistor lead is long enough, you can attach it directly to pin 12 on the IC. Otherwise use a small insulated wire, like the wire-wrap type, to make the connection from the resistor/cap to pin 12 on the IC. Solder a similar-size wire between pins 13 and 14. That finishes the amplifier modification.

I mounted the SPDT, momentary-contact, push-button switch just to the left of the SWR meter. Drill a hole—and watch those chips! Mount the switch. I disconnected the positive lead of the meter from the PC board and attached it to the common pin on the switch.

On my unit, the red wire from the meter is grounded and a gray wire is the positive lead. Connect a jumper wire from the normally-closed pin on the switch to the pad the meter wire had been soldered to.

The normally-open contact on the switch may be used to support the calibration potentiometer. Solder one end of the trimpot to the normally-open pin on the switch. Tie the wiper and other end of the trimpot together with a jumper wire, and solder the other end of the jumper to pin 13 or 14 on the IC. These are the pins shorted together in a previous step.

If your trimpot or switch is too large to allow mounting the pot between the PC board and the front of the chassis, you can mount the pot directly to the jumper shorting pins 13 and 14 on the IC. Use a 1/2-watt resistor lead or similar-size wire to support the pot and short the pins on the IC.

Now we are ready to calibrate the resistance scale. You need a selection of resistors or a trimpot connected to the SO-239 on the analyzer. I set the trimpot to read center scale with a 50 Ω load attached. With that setting, a 22 Ω resistor reads about one-quarter scale to the left and 470 Ω reads way off to the right. Since we all try to keep below 2:1 SWR, it is easy to see if you are 25 or 100 Ω at 2:1 SWR. At 1.1:1 SWR the meter will read center scale. You can calibrate the meter face if you want. A low and high indication is all I aimed for.

That's it! You now have a full-featured piece of gear for your shack. You saved $139. And instead of a 170 MHz frequency counter, you have a 1.2 gig one! Enjoy the project, and happy DX ... 73

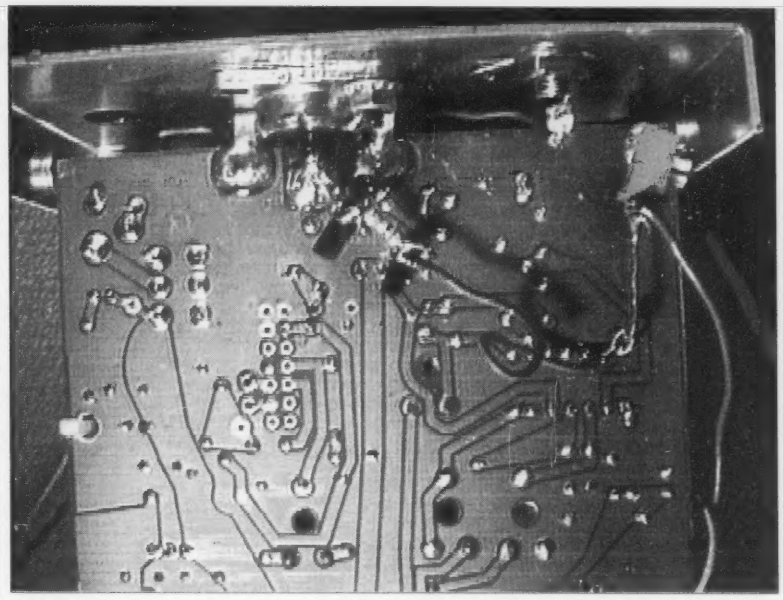


Photo B. *Rear view of PC board showing connections to IC.*

Photo C. *The momentary push-button is mounted just to the left of the meter face.*

Five-Band Magnetic Loop Antenna

Build a loop for QRP, and tune it up just right!

Francis Y. Kelson K2KSY/HL9BK
PSC 450, Box 0826
APO AP 96206-0826

The magnetic loop has been used successfully worldwide for many years, but one of the problems faced by builders today is the acquisition of suitable variable capacitors. Having tried ARCO trimmer caps which overheated on the higher frequencies, I decided to use coaxial cable, since it has the inherent capacity and voltage protection needed for a 5 W-plus QRP signal. All coaxial cable has a specific capacitance per foot value, so it's a simple matter to calculate the length needed for a given capacitance. Also, its light weight maintains the loop's integrity.

With propagation conditions getting better by the day, this little device should lend itself quite well to the QRP purist, or to the person who just wants to SWL or listen to his favorite net. Supplemented with a long wire antenna for the 3.5, 7.0 MHz bands, its noise-canceling ability should make for a good copy.

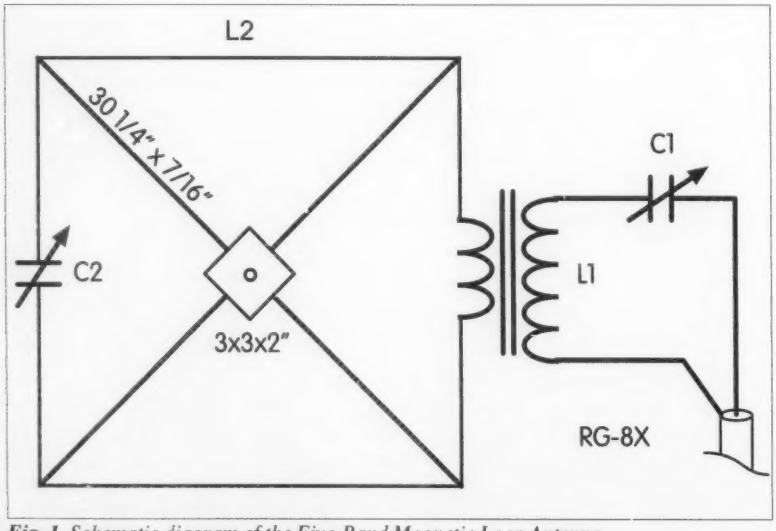


Fig. 1. Schematic diagram of the Five-Band Magnetic Loop Antenna.

Construction

The loop consists of three parts. Printed circuit board 1 (PCB1) tunes the loop to the coaxial input. PCB2 mounts the desired capacitance on the other side of the loop. The loop itself (L2) is supported on a framework of crossed dowels.

Cut four 7/16-inch dowels to 31.5 inches each, and make a 1/16-inch slot in one end of each dowel. Shellac the dowels and set them aside to dry.

You'll need a block of wood for the hub, three inches square and two inches thick. Drill a 7/16-inch-diameter hole into the middle of each side of the block, to a depth of 1-1/4 inches. I also drilled a 1/4-inch hole through the center of the block for mounting. Shellac the block and set it aside to dry.

When the unslotted ends of the dowels are inserted into the hub, they should measure 30-1/4 inches from the hub's outer edge to the dowel tips.

Cut two segments of #22 audio wire, each 7 feet, 4-1/4 inches long. Strip 1/8 inch of insulation from each of the wires' four ends; tin each end with solder. Solder a Caltern™ ring terminal, common to auto wiring (the #22-18 Red are suitable), to each end of the wires.

Prepare two single-clad PCBs as depicted in **Figs. 2** and **3**. You may use something else, just as long as you keep the separation for L2 the same as shown, or else you may have trouble keeping L2 taut with the dimensions shown.

The coaxial input is L1, toroid T 68-7 White, wound with #24 enamel wire 25 turns, spaced approximately one millimeter apart. The secondary winding is prepared by winding the #24 enamel wire for a total of six turns, encompassing at least three-quarters of the toroid's primary. This will approximate a 75-ohm input, which is easily matched up with the RG-8X coax.

Remove the insulation from the toroids' four leads, and solder to PCB 1 (**Fig. 2**). Solder C1 across the copper traces on PCB1 as shown.

At this time you may want to apply coil dope or clear fingernail polish to coil L1.

Note that the negative PCB trace continues along a path beneath C1, so don't mount C1 flush against the PCB.

Mount the ring terminals of the audio wire to PCB1 and PCB2, using 6-32 x 1" screws, nuts, and washers. Use three nuts on each PCB, so that removal of L2 will be easy later on.

Insert the dowels into the hub, and align the wire on the dowels as shown in **Fig 1**.

You may remark on the fact that, worked out by the formula for determining cross-arm lengths, one quarter of L/7071 = 63.50 inches, but ours is 64 inches. This gives us a slight bow to the loop for rigidity—and it also looks nicer that way.

To build the various capacitors, you will need approximately five feet of RG-174U mini coaxial cable, plus a little extra to play with. Cut all coax as specified by the chart for your frequency of choice.

On each piece of coax, measure off one inch, and remove the outer insulation. Bend the coax at the point where

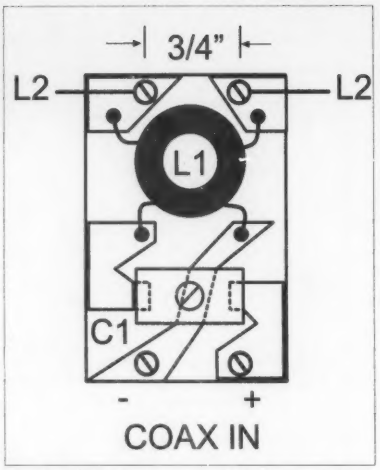


Fig. 2. PCB1 (approximately 2-1/4" x 1-1/2") provides mounting for the input circuit.

the outer insulation now meets the braid. With a sharp-pointed instrument, push aside the braid until the center conductor is exposed; extract it from the braid, leaving two terminal leads each one inch in length. Tin each tip lead, and solder on a ring terminal.

According to **Table 1**, measure off the specified length, from the junction of the braid and center conductor to the coax tip. Hold it!

Despite what the chart specifies, add one inch to each coax. You will use this extra length to compensate for the area density (capacitive effect) in which you will place your loop for operation. I tuned mine in the shack. When I moved it out to the patio there was no change, but this will vary depending on your own surroundings. A 500 pF trimmer was used for the 3.5 MHz band, since the length of coax needed would have been quite long enough. However, this limits the power on this band to only a couple of watts.

If you elect to use the trimmer capacitors for all bands and are going to use two watts or less, just drop me an SASE if you're unsure of values and tuning, and I will be glad to explain it.

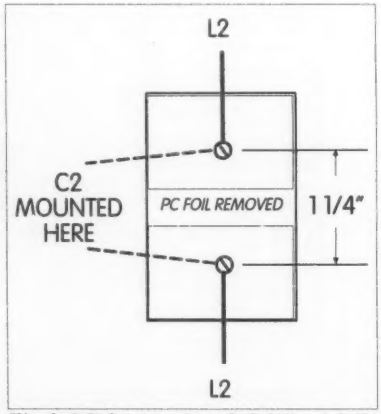


Fig. 3. PCB2 (approximately 2-1/4" x 1-3/4") connects the various capacitors to loop L2.

Tuning the loop

Connect your RG-8X mini coax to the loop's input as in **Fig 2**. You can use just about any length—I've used 16 to 50 feet in various situations. Connect the free end of this coax to an MFJ-249 SWR Analyzer. At this point you should have the capacitor of choice mounted securely to PCB2.

Search the analyzer for a frequency that obtains a dip. With the added one inch of coax, your frequency should be somewhat lower than expected. Then adjust C1 for the best dip possible. C1 will pull the loop's resonance point a little higher in frequency, so adjust the analyzer a little higher in frequency, and you will note that the SWR is getting lower.

Start to trim your RG-174 coax, about 1/8 of an inch at a time, until you are very close to the frequency selected, and repeat the procedure:

1. Check frequency for a dip.
2. Adjust C1 for a dip.
3. Check frequency again.
4. Trim coax, recheck frequency.

Repeat steps 1 through 4.

Once all your coax caps are resonant, simply roll the larger lengths of coax over two fingers and secure with a rubber band or tie-wrap. The 18 and 21 MHz capacitors are short enough to just hang freely.

Once C1 is optimized, for purity an antenna coupler can be used despite C1 being in series. Since the loop's bandwidth is about 50 kHz, the antenna coupler will allow wider frequency variations.

Desired Frequency	Length of Coaxial Cable
7.0 MHz	26-1/8 inches
14.0 MHz	5-3/4 inches
18 MHz	3-1/8 inches
21 MHz	1-5/8 inches
3.5 MHz	1 each Arco trimmer 500 pF

Table 1. *RG-174U chart.*

A wattmeter or SWR meter placed at the input of the loop should reveal a flat SWR when full power is applied. If it doesn't, retune the coupler and retouch C1. Proper tuning is the key to success when using an antenna of this type. Use of a field-strength meter or neon lamp is a great help, too.

Qty.	Description
4	7/16" dowels, each at least 31.5 inches long
1	Wooden block for hub, 3 x 3 x 2 inches wide
15	Feet #22 insulated audio wire
5	Feet RG-174U mini coaxial cable
1	PC board, single sided, 3 x 5 inches
12	Caltern ring terminals, Red #22-18
1	Toroid, T 67-7 White
5	Feet #24 enamel wire
1	trimmer var. cap 500 (from Marvac, San Diego, CA)
6	6-32 x 1 inch screws
16	6-32 nuts, plus 12 #6 lockwashers

Table 2. *Parts list.*

For operation outdoors, a couple of plastic pill bottles can be slipped over PCBs 1 and 2.

Seal the coax caps with Shoe Goop™, or cement, at their tips and terminal junctions.

If you cannot beg, borrow, or acquire an MFJ-249 SWR Analyzer, you could use a grid dip meter to acquire resonance, and with the application of very little RF power, obtain a roughly suitable SWR.

I have accomplished QRP DXCC, WAC QRP, and 1,000 miles per watt with Argentina using one watt of power. I also have 40 states confirmed, using mostly wire and loop antennas. 73

Electronic Construction from A to Z, Part 3

Everything you wanted to know about building stuff but were afraid to ask.

Marshall G. Emm N1FN/VK5FN
2460 S. Moline Way
Aurora CO 80014
[n1fn@mtechnologies.com]

If you've been following along with this series of articles, you will have a brand-new, working, VM-110 AC voltage monitor (see end of text for purchasing information), ready to install in some sort of enclosure. That's what we're going to talk about this month—installing projects in enclosures and finishing up the project so that you will have a useful, attractive device that you built yourself!

When you have built a few projects it might suddenly dawn on you that the "fun part," the electronic work of soldering components onto circuit boards and getting things to work, is usually *less than half of the job!* Getting the project installed neatly in a box, with labeling or panel marking that doesn't look like it was done in kindergarten, is a lot of work. It involves different skills, and different tools, and is always going to be time-consuming. But it's worth it, as we shall see when we finish the job.

The first problem is to find an appropriate enclosure, or, as we say in the trade, a box. Aside from the obvious considerations of size and shape, you should also think about whether the box should be plastic, or metal, or plastic with a metal panel.

Paper or plastic?

Oops! Wrong question. *Metal* or plastic? Your choice will depend on the nature of the project and what you have in the way of tools--plastic is, of course, much easier to work with. But if you are working with an RF circuit or one which will be used in an RF environment, you will want to use a metal box because of the intrinsic shielding effect. Another factor is whether the enclosure must, should, or could be used as a common ground for the circuitry it is to contain. Some controls need to be completely isolated from ground (e.g. the air-variable capacitors in many antenna tuners) and a plastic box makes this a lot easier. One last consideration in this regard is whether the circuit board will need to be physically attached to the inside of the enclosure, in which case clearance of components and solder tracks from the enclosure is a factor if the enclosure is conductive.

Size and shape are fairly obvious parameters, but it is generally a good idea to get a box that is one size larger than the minimum size to contain the project. You may also want to think about how you will use the device when it is finished. If it is an "active" device, such as a keyer, you may want to put it in a box that is much larger than actually required so that (a) it will stay in one place on your desk, and (b) you can find the controls without looking.

A good place to start is to "pre-visualize" your completed project. Famous photographer Ansel Adams is credited with inventing the term to describe the process he used in creating a photograph. Try to picture what the device will look like when it is complete, and how it will be used. Some controls, indicators, connectors, etc., need to be immediately accessible (e.g., on the top or front of the box), while others can be located on the back or sides. In some cases you may want to drill "access holes" for board-mounted trimmers. And don't forget the wires! If there will be wires entering the box rather than connected via jacks, then there will have to be holes for them, usually on the side of the box closest to where the wire goes when the unit is in operation.

You should also devote some thought to how the device will be mounted in the box. If it is something like a QRP transceiver that is likely to

need adjustment or alignment or modification from time to time, then you want to make it fairly easy to open it up. A normal box has six surfaces (four sides plus top and bottom) that you can attach things to—if you use more than two of them you will have a real Chinese box puzzle to take apart! If there are board-mounted controls to which you will need occasional access, then be sure to use enough wire when you connect the board to the panel that you can remove the panel and have room to work without having to disconnect wires.

Yet another tool kit

Fortunately, if you have the basic electronic tools described in Part 1 of this series, you have most of what you need to work with enclosures. The most important additional tool is an electric drill (or drill press) and a set of good drill bits in various sizes. If you are going to do a lot of building, you might want to think about an inexpensive drill press. Sears™ has one for around the $100 mark. It has other uses around the shop and home, and there is really no substitute when it comes to doing precise drilling. The drill bits themselves usually come in sets with graduated sizes. You have your choice of SAE, metric, or "numbered" series, but I'd suggest going for a good set with 1/32" increments, which will allow you to match just about any required size. A set up to a maximum diameter of 3/8" will cover most requirements, but you might also want to purchase individual bits for 7/16" and 1/2". The larger bits are often available with a 1/4" or 3/8" reduced shaft.

The drill and bits are all you need for the VM-110 project, but here's a list of tools to round out your collection:

Center punch, for marking the location of holes to be drilled and scribing lines on metal.

Hacksaw, for cutting the ends off the shafts of pots and rotary switches.

Hacksaw *blade*, for use by hand.

Calipers, for measuring drill bits, shaft diameters, and hole diameters.

Files—flat, round, and half round.

Sheet metal nibbling tool, for making odd-shaped holes.

Crescent (adjustable) wrench, small, for tightening nuts on pots and switches.

Oh ... some builders recommend a heavy (2–3 lb.) hammer and an anvil, because if your kit doesn't work it is much more rewarding to smash it on an anvil than to simply throw it at the wall. You won't need them though, because your projects *will* work. And if they don't—we're going to talk about troubleshooting next month.

A box for the VM-110

Having due regard for all of the considerations mentioned above, I chose the Radio Shack™ #270-230 for the VM-110 project. It's a plastic box with a thin aluminum panel. There is enough room in the box to work comfortably, and also for a second unit if we decide to add the VM-12 DC voltage monitor later.

To install the VM-110 in the enclosure, it is necessary to drill holes only for the LEDs, and make some provision for the power cord (from the wall transformer). The circuit board will be mounted to the metal panel simply by gluing the LEDs in place.

While you could drill a hole near the bottom of the box for the cord (and that is something you will often want to do with more elaborate projects), in this case it is very easy to cut a small notch in the top edge of the box (at the right end as you are looking down on it). That way you can remove the thing from the box without disconnecting the power cord if you need to later. **Fig. 1** shows the details of the notch.

To make the notch, make the two vertical cuts with your cutters or hacksaw blade, then bend the tab back and forth with a pair of ordinary pliers until it breaks off.

DO NOT use this approach with a metal enclosure, though—the power cord will need to be insulated from the enclosure with a grommet, and a round hole is a lot easier to work with.

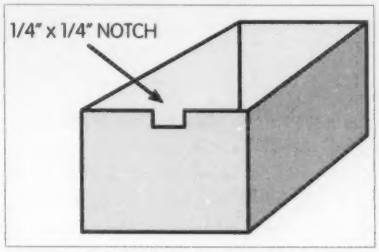


Fig. 1. *Cut a notch in the end of the box for the power cord.*

Laying out the panel

Once you've chosen your enclosure, the next step is to lay out the panel and do any necessary drilling and fitting.

Laying out the panel is simply a matter of marking the locations of holes for the hardware that is to be mounted on it. It seems as if I am always telling you that there are two ways (or more) to do something. Guess what? There are two practical ways to lay out your panel. The first is to physically measure everything and make appropriate marks directly on the panel. The second is to use a template, or a paper representation of the panel that can be attached to the panel and drilled through. The VM-110 is such a simple project that you can easily do it "by hand," but I've provided a template which can be used (**Fig. 2**) if you are using the specified Radio Shack™ box.

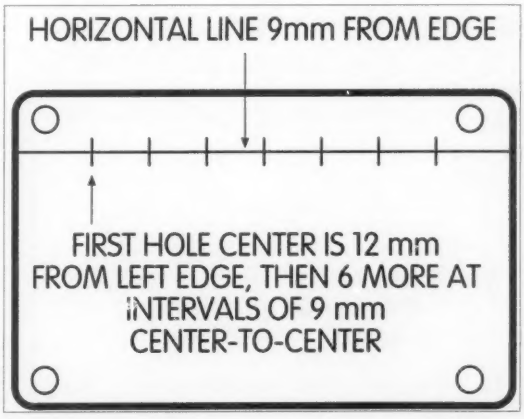


Fig. 2. *Panel drilling template for the RS #270-230 box. Hole diameter is 11/64- or 7/32-inch.*

There are four steps to laying out the panel by hand:

1. Define the job. In this case, determine that you need seven holes in a straight line.

2. Do the measurements and arithmetic. A short (six-inch) flat steel rule (obtainable from most hobby shops and business supply houses) is perfect for this. If you must use a tape measure, use an old carpenter's trick and measure from the one-inch line rather than from the hook on the end of the thing—just remember to subtract the inch from absolute measurements! It helps greatly if you are familiar with the metric system and have a metric rule, because the arithmetic is so much simpler. For example, let's say you have seven holes, 11/32-inch apart. How far is it between the two end holes, and how far is the first hole from the left edge of the panel? You'll find it's much easier to use 9 mm instead of 11/32-inch. You will also note that the actual specifications of many components are metric. Getting down to specifics now, when you measure the LEDs on the VM-110 you will find that they are generally 9 mm apart (measuring from the center of one to the center of the next). The leads are slightly flexible, but if you hold the ruler firmly against them you will see that they can all be centered at 9 mm. So what we have learned so far is that we are going to need to lay out seven holes in a straight line, with 9 mm between the centers. The length of the line will be the total sum of the distances between the holes, or the spacing times the number of holes minus one. In this case, the line from the center of hole #1 to the center of hole #7 will be 54 mm long (9 mm x 6). The width of the panel is 78 mm, so to center the line you would find the "unused" width, namely 78 - 54 = 24 mm and divide by two to give you the empty space on each side of the line—12 mm. Or, to put it another way, the first hole will be 12 mm from the left side of the panel. Double-check everything, and make sure that the installed components will still fit inside the box if mounted in these positions.

3. Mark the panel. You mark it with a pencil or a pen (depending on what the surface is like) or scratch your marks using an awl or a center punch. For the VM-110 we need to mark the positions for seven LED holes on the panel. Start with a straight line across the width of the panel, 9 mm from the top edge. Mark a spot 9 mm down from the edge at the left side of the panel, then another spot 9 mm down from the edge at the right side, then use a straightedge to draw a line between the two marks, across the panel at a consistent 9 mm from the top. Measure 12 mm along that line from the left edge of the panel and mark the position for the first hole. Measure and mark the other six holes at 9 mm intervals (again, metric makes it easy because you can just add nine to the last position mentally and read it straight off the ruler). You should now have seven marks, and the rightmost one should be 12 mm from the right edge of the panel.

4. Check it all again. Seriously, you haven't done anything yet that can't easily be undone. Go one step further and you risk ruining the panel if you made a mistake! Or as my carpenter father-in-law always says, "measure twice, cut once."

If you have a drilling template for the panel (**Fig. 2**), you can avoid all the hassle of measuring and calculating—just attach it to the panel with rubber cement or cellophane tape.

Punching and drilling

By punching, I mean center-punching the hole locations, not using a punch to create the hole! Whether you hold it in your hand or are fortunate enough to own a drill press, any drill will have a tendency to wander if you don't center-punch the material before you drill. A center punch is the correct tool for the job, but you can use an awl or a nail if need be. Place the panel on a block of wood or other hard surface, and carefully place the tip of the punch on the mark for the center of each hole. Tap the end of the punch *gently* with a hammer or mallet so that the punch leaves a tiny dent in the metal. If you are working with plastic (and sometimes

with aluminum), you can get an adequate dent just by pressing firmly on the punch rather than hitting it with a hammer.

Drilling can be tricky, and despite the ready availability of power equipment and high-speed twist drills it is worth going over the basics. As with most tools, you develop skill as you go and if you are experienced at drilling holes in things you will have no trouble with this sort of work. On the other hand, if you have never used a drill before, you will find it is tricky at first—but it gets easier with practice.

Start small! Drill each location with the smallest drill bit you have (often 1/16-inch) and gradually re-drill each hole using bits about 1/8-inch larger until you get to the required size.

Use a backing block! Clamp the panel firmly to a block of wood and drill through the panel into the wood. This will reduce (if not eliminate) burring on the bottom side of the panel, and reduce the likelihood of the panel slipping. You will be tempted sometimes to hold the material by hand, but you will learn over time when it is safe to do that and when it is likely you will end up with a sprained or broken finger, or worse. Eye protection is also a must.

For our VM-110, you can probably drill the pilot hole and then go straight to the 7/32-inch final size. The actual size of the hole (or diameter of the LED) is probably some neat metric size, but most of us don't have metric drills. The closest I could measure was 11/64ths, but if your drill sizes are in 32nds you'll have to use 7/32. A quarter-inch drill will work too, but it is not as neat a fit.

Once the holes are drilled, you will need to remove the burring on the bottom side of the panel. You can do this with a file, a rosette countersinking bit, or even your hobby knife as long as you are working with aluminum or plastic. Another technique is to use just the tip of a slightly larger drill bit (which is what you will probably have to do with a steel panel).

Check it all again. In this case, if you made a terrible mistake of some kind you can start over and re-drill the holes on the other side of the panel—the suggested panel label will cover the

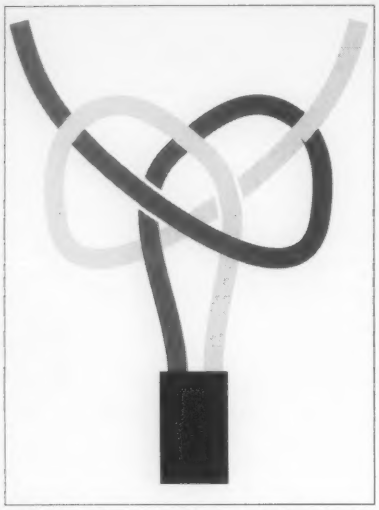


Fig. 3. The "Electrician's" or "Underwriter's" knot.

unused holes, or you can cover them with a piece of masking tape if you are labeling your panel that way.

Hole too small?

That's not going to be a problem with this project, but since it is such a common problem I'll give you a couple of pointers. The techniques vary quite a bit depending on the material you are working with as well as the size and shape of the hole and, of course, the tools available to you.

Let's say you need to mount an SO-239 coax connector, which has a hole about 5/8-inch in diameter, and the largest drill bit you have is 3/8-inch. The "correct" solution is a chassis punch, but who can afford those?

So you'll have to make do. Drill the hole to 3/8-inch and then use a pencil or scribe to trace around the connector so you can see how large the finished hole must be. Then use one of the following techniques to enlarge it.

Bad—a flat or triangular file.

Good—a round file. A good choice is one of the round files used for sharpening chainsaws, because they are readily available and relatively inexpensive. Just file the hole out to the line that you marked, checking the fit periodically.

Better—a half-round file. A half-round file (rounded on one side, flat on the other) is much easier to use with larger holes because the curve is more gentle and it is easier to control.

Alternative—a small grinding cylinder on a drill press or Moto-tool™. You can also use a small sanding drum if you are working with aluminum or plastic.

If the hole is much larger than the largest drill bit, then you might want to use a very small bit to make a series of holes around the area that needs to be removed. The less material you have to remove with the file or grinder, the better.

Holes with corners?

No problem. This seems to be a real challenge for a lot of builders, but producing a rectangular hole is just a matter of patience and the right technique.

If the hole is large enough, an inexpensive sheet metal nibbling tool will get the job done in no time. The nibbler takes a tiny, rectangular bite out of sheet metal and it's simply a matter of nibbling your way around the opening. Leave a bit of an edge, though, because the finish is not very smooth and you will want to dress the opening with a file.

Another option is to drill a line of very small holes around the opening, then use a hacksaw blade to cut between them, finally cleaning up the line with a file. Drill one larger hole at a corner of the opening so you will have a place to insert the hacksaw blade. You might want to wrap some duct tape around the end of the blade that you will be holding—otherwise it's pretty hard on your hands. For a fairly large opening you might even want to insert the blade through the hole and then reinstall the hacksaw frame. If you have a scroll saw or a saber saw you can get hacksaw blades for them, too.

Putting it all together

Now it's time to install the circuit board in the enclosure. Or is it? If you are going to use an adhesive label for the panel, you need to apply it to the panel *before* you install the board, so skip ahead to "Making it pretty" and come back to this section when you have your label finished.

The seven LEDs on the VM-110 should fit neatly into the seven holes you drilled in the panel. Hold the board straight (so that it is parallel to the panel) and secure the LEDs by applying a good all-purpose cement or hot glue on the *inside* of the panel. Use a liberal amount, because that's all that's going to hold it together. And that's it. Now guide the cord into the little notch you made, slap the lid on and screw it down.

It's a good idea to put a knot in the cord on the inside of the enclosure near the hole where it enters. Then if someone pulls on the cord or it gets caught on something, the knot will take the strain and prevent the connections to the circuit board from coming loose. For two-conductor cords such as used in the VM-110, a simple "electrician's knot" will suffice. Split the two conductors over a distance of about two inches from the end and tie the knot as shown. This is one of those cases where a picture is worth a thousand words (**Fig. 3**). Obviously the end of the cord must be free, i.e., not connected to the circuit board. If you'd rather not disconnect it, you can tie a simple overhand knot.

Making it pretty

Commercial kits often come with a box that has been silk-screen printed or which has a printed decal to show the manufacturer's logo and necessary control indications. But that is a hugely expensive process that is impossible to justify for run-of-the-mill kits, especially if you only need *one*.

We've come a long way in readily accessible labeling technology in recent years. I've built things on wooden "breadboards" and made pencil marks on the wood. I've used masking tape with pen and ink markings, and I've used indelible pencils to write directly on panels. And I confess I have a large number of "devices" with no markings at all! Then there are the Dymo™ labels—I remember when they were really cool (and expensive); now they are inexpensive, but they look pretty tacky.

An attractive, inexpensive, and reasonably simple approach is available now if you have a computer graphics

program and a good printer (say, 300 dpi resolution, whether dot matrix, ink jet, or laser). The computer program lets you design a very attractive label for your panel, and the printer will produce the label on self-adhesive material which you can easily apply to the panel. If your "working conditions" don't include an adequate computer, program, or printer, you may be able to use one at your local Kinko's™ or even a public library.

As usual, I'm going to give you the specifics of how I prepared the front panel artwork for the VM-110 project, but the principles can easily be adapted. I'll try to explore a number of options, but first I'll give you the summary on how I do most of my small project labels.

•Design the label using a computer graphics program.

•Print the label on whole-sheet label stock (Avery # 5265 or #8165). Sometimes you can also use a copy of the finished artwork, printed on plain paper, as a drilling template.

•Apply the label to the panel.

•Apply an over-coat of clear self-adhesive vinyl (e.g., book-cover material), available from most drug stores and stationers.

•Clear the material from the holes and mount the controls.

•Apart from protecting the label from fingerprints, the clear vinyl also protects the ink—I use an ink-jet printer and the black ink is not waterproof.

•An obvious option, which I have seen used to good effect, is to paint the panel, then apply a label printed on *transparent label stock*.

The computer program needs to be capable of drawing with a fairly high degree of accuracy in literal scale (that is, if it says it's an inch on the screen it should print out as an inch). I use WordPerfect™ Version 7, which incorporates a cut-down version of Corel Draw™ that is adequate for most purposes.

Most drawing programs have a quick means of drawing squares and rectangles, so I usually start by drawing an outline of the panel, just to provide visual reference points and measurements from edges (I delete the outline before printing). Use small circles or dots to indicate the position of holes for controls and mounting screws—these will help you line up the label when you apply it to the panel. Remember to leave clearance for knobs for pots and such! It's extremely frustrating to go to a lot of trouble to produce a panel label and then discover that when you put the knobs on the shafts, you've covered up your text.

Print the label on plain paper first, and hold it (and the panel) up to a strong light so you can see that everything lines up. Once you have it right, print it on the label stock. I usually print out two copies, just in case!

Indexing the label to the panel is not difficult. I usually hold the panel and label up to the light and use a pencil to mark the position of a couple of holes. Then on a cutting board I put the panel on the label, matching the pencil marks, and trim around the panel with a hobby knife. I repeat that process with the clear vinyl, then use the hobby knife to trim out the label material from the holes.

The first time I prepared a project label this way it seemed like an awful lot of work, but the results were certainly worth it. As time goes by it gets a lot easier.

But what if it doesn't work?

If you go outside late at night, most any night, and listen closely, you can faintly hear the pathetic sound of kit builders all over the world crying because they just can't get it to work. There are screams of rage, too, and crashes as non-functioning kits hit the wall or are reduced to atoms on the anvil. You can smile, though, because you are outside getting a breath of fresh air while you think about what to build next. We hope. But even in the best of families, things occasionally will go awry and Murphy is always lurking. If your project doesn't work, 97 times out of a hundred it will be because you did something wrong. One time in a hundred it will be due to a faulty component, and one time in a hundred it will be due to a mistake in the instructions. The hundredth time? We will never know.

Finding a problem cause can be time-consuming and frustrating, but it doesn't have to be. All you need is a plan, and we'll see if we can come up with one next month.

Rainbow Kit VM-110 ($10.95 + $5 s/h) is available from Milestone Technologies Inc., 3140 S. Peoria St. Unit K-156, Aurora CO 80014, or call (800) 238-8205 for credit card orders. Also available from Electronic Rainbow Inc., 6227 Coffman Rd., Indianapolis IN 46268, or call (317) 291-7262. 73

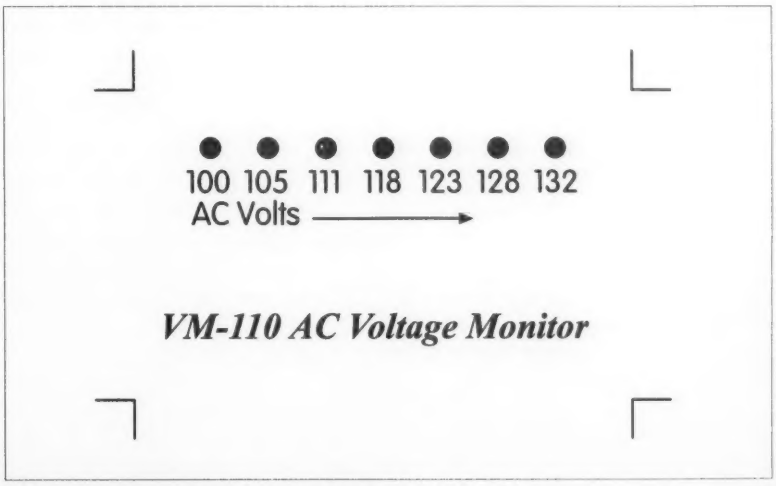


Fig. 4. Panel artwork for self-adhesive label.

Mount Up!

Try this easy cell phone-to-2m antenna conversion.

Tom Smith WQ3A
2106 Mark Street
Bel Air MD 21015

Having read several articles on constructing mobile-mounted two-meter antennas, I set out to build one from ideas I got in *73* on how to convert an 11-meter (CB) antenna to two-meter use.

At a local radio store, I saw several low-cost CB antennas and was leaning toward the cheapest. I went through its disassembly instructions provided in *73*. The article was very well written and clear, but being the cheap, cheap, cheap antenna builder I am, I was still on the lookout for an even *cheaper* and easier antenna to convert.

In reviewing sales pamphlets and bulletins from several electronic surplus companies, I noticed a 900 MHz cellular magnetic mobile-mounted antenna. They were certainly in the right price range: $6 each. Furthermore, the catalog stated that this antenna element was easily unscrewed from its magnetic base.

Fine, I thought to myself: This feature might be just the thing to lend itself to the construction of a two-meter antenna. I counted the money I had left in my monthly allowance. Good news. I had saved enough for four antennas, including the shipping cost.

I immediately phoned in my order to All Electronics Corporation™. I found the salespeople there were very helpful and just plain nice to deal with. I waited with bated breath for delivery.

Finally, the magic knock on the door. Yes, it was the UPS™ man. He was very fast. By the time I reached the door, he had left my antennas and was halfway down the block! I picked up the antenna package and went straight to the basement workshop. Upon opening the packages, I was pleasantly surprised by a better-than-advertised antenna.

Construction

First, I unscrewed the 900 MHz antenna element from its magnetic base and laid it to one side. I checked the antenna mounting stud, a threaded stud whose size looked comfortingly familiar. To be sure, I got out the gauge and to my great relief it was, in fact, a 1/4-inch times 20 thread.

My next step was to check out the inside of the magnetic base itself. This task was very easy. I simply took a sharp knife and carefully cut the plastic cover from the bottom of the magnetic base.

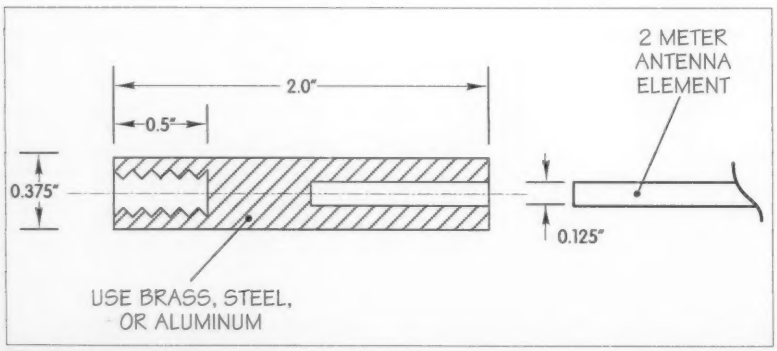


Fig. 1. *Adapter assembly.*

WEB & Internet Access Compliments of EriNet

DAYTON hamvention® 98

May 15, 16, 17, 1998 ■ Hara Arena, Dayton Ohio

SPONSORED BY THE DAYTON AMATEUR RADIO ASSOCIATION, INC.

TICKET DEADLINES

- Advanced registration orders must be postmarked no later than May 1 (USA) or April 24 (Canada).
- Ticket requests that are received **AFTER** the deadline will be processed and **HELD** for pick-up at the Hara Arena box office beginning Wednesday, May 13 at 9:00 a.m.

EXHIBIT SPACE

See our Web site for more information. (www.hamvention.org)

- **Inside Exhibit Booths**
  For an application, please Fax (937) 376-4648 or E-mail to exhibits@hamvention.org
- **Outdoor Flea Market Space**
  For an application, please Fax (937) 276-8902 or E-mail to fleamkt@hamvention.org
  Flea market spaces are sold IN ADVANCE ONLY. No spaces sold at gate!

UNOFFICIAL ACTIVITIES

To be listed in our program and on our Web site, please Fax (937) 274-8369 or E-mail to info@hamvention.org

SPECIAL SERVICES

Details are available on our Web site. (www.hamvention.org)

- A limited number of paid reserved ADA parking permits are available. Free ADA off-site parking is also available. Please send requests via Fax/Phone: (937) 669-1163 or E-mail to lmccoy@glasscity.net
- License Exams reservations are recommended. Walk-ins accepted, if room is available.

BUS SERVICE

Bus service will be provided between Hamvention, Air Force Museum, Salem Mall and Forest Park Mall parking areas. Check our Web site for more information. (www.hamvention.org)

GIANT THREE-DAY FLEA MARKET

EXHIBITS

ACTIVITIES FOR THE NON-HAM

COMMUNICATIONS

WWW: http://www.hamvention.org
MAIL: Hamvention, Box 964, Dayton, Ohio 45401-0964
FAX: (937) 274-8369
E-Mail: info@hamvention.org
PHONE: (937) 276-6930. Chairman Voice Mail box numbers are available on our Web site.

General Chairman: Dick Miller, N8CBU
Asst. General Chairman: Jim Graver, KB8PSO

ADVANCE REGISTRATION

FOR CHECK OR CREDIT CARD ORDERS:
Make checks payable to: Dayton HAMVENTION
Enclose the amount indicated in U.S. dollars. For credit card orders, please add $1.25/ticket service charge. *A $25 service charge will be assessed on all returned checks.*

Mail to: Dayton Hamvention Box 1446 • Dayton, OH • 45401-1446
or FAX to (937) 278-4633

Please type or print your name and address clearly!

	Quantity		
Admission (valid all 3 days)	_____	@ $15.00*	= $ _____
Grand Banquet	_____	@ $30.00**	= $ _____
Alternate Activities			
Saturday Luncheon	_____	@ $10.00	= $ _____
Credit Card Service Charge.	_____	@ $1.25/ticket	= $ _____
			Total $ _____

* $20.00 at door **$35.00 at door, if available

❑ ❑ Call

Expiration Date: Month Year

Name _____

Address _____

City _____ State Zip _____

Daytime Phone ( ) Evening Phone ( )

PLEASE PRINT! THIS IS YOUR RETURN LABEL.

DAYTON hamvention® 98

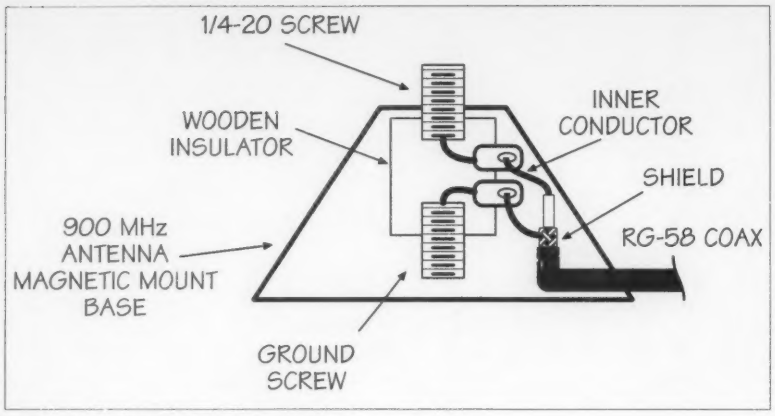


Fig. 2. Internal magnetic base connections.

(Please use care in performing this operation.) Once the cover is removed, use pliers or a wrench to remove the nut. Set the nut and magnet to one side. This completes the disassembly operation.

Start construction with the antenna adapter assembly (**Fig. 1**). Cut a two-inch piece of a 3/8-inch-diameter metal rod (this rod can be brass, aluminum, or steel). This piece will be the adapter assembly and screw onto the magnetic mounting base to hold the two-meter antenna element.

Using a #7 drill bit (0.2030), drill a half-inch-deep hole in one end of the adapter assembly. Thread this hole using a bottoming tap (size 1/4 inch x 20). Check out this drilling and tapping operation by screwing the two-meter adapter assembly onto the base of the 900 MHz antenna stud. Use a wrench to tighten the two-meter adapter assembly to a snug fit. Do not tighten the adapter assembly too much. This checks out the drill and tap operation for a good fit.

Unscrew the two-meter adapter assembly and lay it aside. Cut a 1/8-inch-diameter welding rod to a 20-inch length. Clean two inches of one end of the welding rod, using sandpaper. Keep cleaning until the two-inch length of the rod is bright and shiny.

Now, using a medium-wattage soldering iron and 60/40 solder, tin the clean end of the welding rod. Then solder a small ring of solder around the tinned area for a length of one and a half to two inches from the end of the rod. This tin-and-solder operation becomes a shim to ensure a tight fit in the opposite end of the two-meter adapter assembly.

To mount the two-meter antenna element to the adapter assembly, secure the two-meter adapter assembly in a vise. Tighten the vise around the adapter assembly firmly, but do not warp it. Insert the tinned-and-soldered end of the two-meter antenna element into the 1/8-inch hole of the opposite end of the adapter assembly (using the soldering iron). This completes the assembly of the two-meter antenna element and its

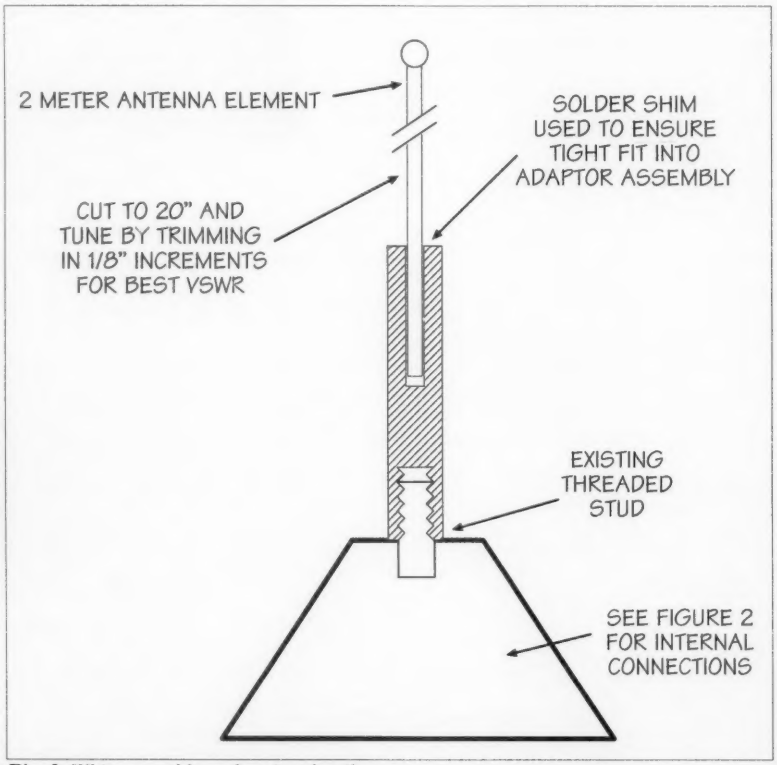


Fig. 3. Whip assembly and tuning details.

adapter assembly. Note: Out of the box, the 900 MHz antenna has a TNC connector. I cut off this connector and installed a BNC-style connector. See **Fig. 2** for cable connections within the base.

Tuning

I cut the two-meter antenna element extra long to ensure that I could cut and tune it to the frequency of choice, and allow the antenna element to be inserted deep enough into the adapter assembly to provide mechanical stability (**Fig. 3**). I used the MFJ analyzer (the one with a digital frequency readout and SWR meter) to tune to the 146 MHz frequency and a low SWR reading. Mount the two-meter antenna and its adapter assembly to the mobile antenna base by simply screwing it in for the final time.

To check out the antenna in operation, I mounted the newly converted two-meter antenna and its magnetic base near the center of the top of my vehicle. I connected the coax to the transceiver and listened on the local repeater (146.85 MHz). My QTH is about 15 miles from this machine. I was able to get good signal reports from several mobile and fixed stations. I drove my vehicle up to a speed of 55 mph, then stopped and checked the antenna and its magnetic base. The entire antenna held up very well.

Bonus 70 cm antenna

To make a 70 cm antenna from the original 900 MHz one, measure 7-3/8 inches from the top of the 900 MHz antenna. Mark this spot with suitable masking tape and marking pen. Make the actual cut with a hacksaw or heavy-duty pliers. Screw this new 70 cm antenna into the existing mobile magnetic mount and tighten firmly.

I checked the SWR using a UHF SWR meter. The initial SWR reading at 449.775 MHz was a 1.5-to-1 ratio.

I was able to key our local repeater using low power on the transmit. This produced full quieting.

I figure I sure got my six bucks' worth! 73

SatTrack: Automatic Antenna Tracking For the Rest of Us

Enjoy tracking satellites even if you don't have a trust fund.

Andrew A. Skattebo KAØSNL
421 N. 10th Street
Petersburg IL 62675-1225

For several years I've been searching for a simple, inexpensive system to add computer automated tracking capability to my satellite station. The workload of pointing antennas and tuning radios during a short satellite pass is exciting but a little too demanding for my taste. This was the main reason I have not been very active on the low-orbit satellites. Up to this time adding automatic tracking capability meant spending a small fortune for the system or home-brewing most of the hardware and software yourself. Normally, a dedicated satellite rotor system must be purchased. Then you have to find a tracking interface to go between your computer and those rotators. This would usually take around $700 to get an automated system going, buying everything off the shelf. Some of the systems claim to offer low-cost satellite tracking but I found that most of these required either an expensive interface and cheaper TV rotators or a low-cost interface and expensive rotors. This still leaves you with one or more expensive components to purchase.

The situation has changed a bit recently with the introduction of the SatTrack system from C&S Engineering. The system uses inexpensive Gemini® TV antenna rotators and a special interface board that goes between your DOS computer and the rotators. The interface board takes the place of the rotor's control boxes and the included software works in conjunction with InstantTrack to control the rotors. With the included software, the board and two rotators, you can have a complete computer-controlled satellite tracking system which can be put together for around $200!

The interface board is available from C&S Engineering three different ways: a kit of parts; a built PC board; and a wired-and-tested unit in an enclosure. The kit version includes all board-mounted components. The builder must populate the supplied PC board and supply all outboard components. For both the kit and built PC board versions the builder supplies a power transformer, all connectors and an enclosure. The completed unit is fully wired and ready to operate as shipped. All three of these options come with the SatTrack software to operate the rotors and a replacement potentiometer to modify one of the rotors. Since this is not a complicated board and does not use any surface-mount components I decided to tackle the kit version and save a few dollars in the process. In addition to the kit, I ordered the rotor mounting plate to adapt the TV rotators to satellite use. This plate allows you to turn one of the rotors on its side for use as an elevation rotor.

Here we go

My package arrived about a week after ordering and I took a quick inventory of the included parts. There is a 3.5-inch diskette with the software, a bag of parts with the PC board and some well-done CAD drawings including a schematic, a parts placement diagram, and a wiring diagram for connector wiring. All other instructions and information are in text files on the disk that may be printed out for your convenience. As mentioned earlier, several components must be supplied by the builder whether you purchased the kit version or the built PC board version (see **Additional Parts**).

Even though the board is fairly straightforward to assemble and

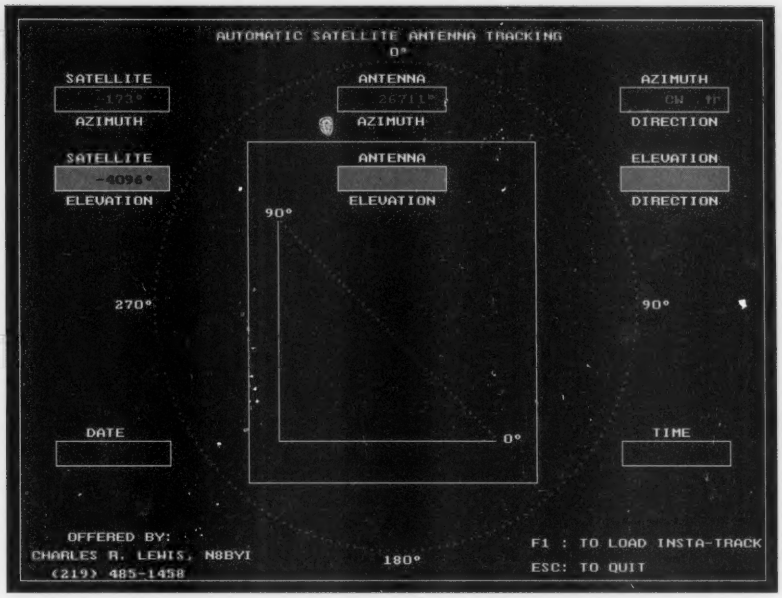


Photo A. *Screen capture showing SatTrack graphical display. Note: The controller is not connected so the display does not show real-time values.*

connect, I am hesitant to recommend it as a "first-time" kit project. There are really no instructions included for building up the board other than the CAD drawings. If you have some previous experience or someone nearby who can help, this is really not a problem. However, if you are not familiar with reading schematics or haven't home-brewed before, you may consider spending the extra money and getting a completed unit. Please be aware that even if you purchase the wired-and-tested SatTrack box you will have to do some surgery to the azimuth rotator, so even this option is not completely "plug & play."

Construction of the PC board simply involves populating the board using the schematic and the parts placement diagram. I was a little rusty at building and had to contact C&S for some clarification on parts identification. Every E-mail to C&S produced a quick and helpful reply so don't hesitate to contact them when a question arises. Once I was squared away on parts identification, the process went pretty fast. It took much more time to do the external wiring and chassis preparation than it did to populate the board.

With the PC board complete, you will need to find a suitable case for the project and make the external connections. I found a nice-looking enclosure at the local Radio Shack™ in the form of a metal box approximately three by eight by six inches. While you're there you can pick up the rest of the required components and you'll be ready to finish the project. To prepare the enclosure you'll need to do some drilling, and two cutouts are required to mount the 9-pin and 25-pin connectors. I used a Dremel™ tool and a template to make the required cuts. They aren't perfect, but it did work pretty well. For the power supply hookup, I used a three-prong grounded cable. I felt better about using a grounded cable since the rotor cable was going outside and up the tower. Also, no power switch is included in the diagrams, but I chose to include one on the front panel. Many of these little details are left up to the builder's skills and discretion. This gives you the opportunity to "customize" your project to suit your needs.

With the board assembled and put in the enclosure, it's time to modify the azimuth rotor. This modification involves replacing the potentiometer in the rotator with a new one supplied with your SatTrack unit. Instructions on this modification are included in a text file and detail the steps necessary to complete the task. I was a little intimidated at first, but the operation was simple and took just over an hour to complete. When disassembling the rotor I recommend labeling all the gears so you have no problem getting everything back in the proper order. The shaft of the replacement pot must be cut down and notched to match the original unit. You can use the old pot as a guide and grind or cut the new shaft to match. With that done, replace

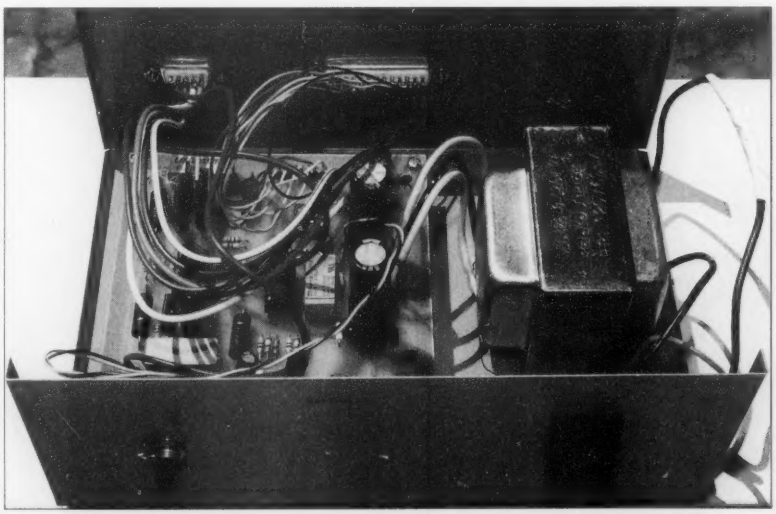


Photo B. *The rotor control board completed and mounted in an aluminum box.*

the pot and reassemble the gears. The new pot is larger than the original, so before replacing the bottom cover of the rotor, a hole must be cut in it to allow for clearance of the new (larger) pot. A hole saw on the hand drill made quick work of that. Remember, even if you purchase a complete wired and tested interface you will need to complete this modification to the rotor.

No modifications are needed to the elevation rotor, so at this point you can mount the two rotors on a section of mast and prepare to calibrate the rotors. The mounting adapter plate from C&S is well worth the low price. This plate allows mounting of your elevation rotor directly to the azimuth rotor. When using this plate, however, you will need to cut the rotor mounting bolts to 3/4-inch to allow for clearance against the housing. Also, with the rotor turned sideways some form of weather protection must be provided. I used some automotive Fiberglas™ to make a cover for the rotors. You may be able to find something at your local discount center that will work.

For the calibration work I set up a short mast and tripod indoors, since you need access to both your computer and the rotors during calibration. C&S Engineering recommends that the length of rotor cable you will use be connected at the time of calibration. This will keep any resistance in the cable from changing the readings of the pots. I chose a heavy-duty "R2" rotor cable from The Radio Works (**Additional Parts**). This cable has two #16 conductors and six #18 conductors.

For the calibration routines, you should follow the directions in the calibration text file included on the disk. With the program prompts and the documentation, the calibration process is pretty straightforward. Follow the instructions and you should have no trouble. I do have two notes, though, on the calibration of the azimuth rotor. If you use the mounting plate adapter, the rotor will operate opposite that of one mounted on its standard mounting bracket since the stationary mast goes through the middle instead of attaching on the side. Just be sure that when you do the calibration the rotor moves clockwise when you command "clockwise" and vice versa. If you are using the mounting plate and it moves opposite, simply reverse the wires going to "azimuth motor" and "motor ground" to get you moving in the right direction. Additionally, be sure that the count from the pot goes up when moving clockwise, and down when going counterclockwise. If you mixed up the wires when installing the new pot this may be backwards. If this is the case, switch the two wires to restore correct operation.

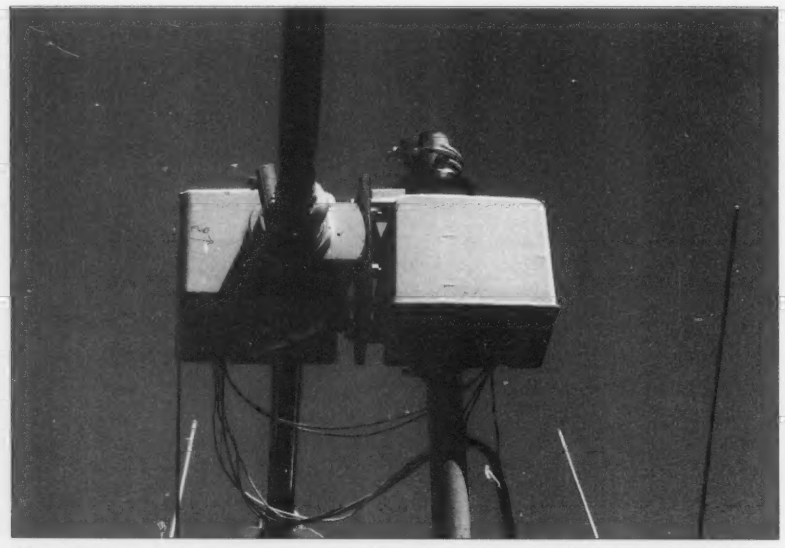


Photo C. *Photo showing rotor mounting using adapter plate. Note hole in bottom of azimuth rotor for new pot.*

Take it home

Once the calibration process is complete, the system is ready for use. Operation of the system is detailed in yet another text file on the disk. First, run the program sattrack.exe (or satttrktx.exe). This will load the necessary TSRs and then will call and load InstantTrack. You select the satellite to track in InstantTrack, and then type "R" to select the rotor driver. Next, exit InstantTrack and the SatTrack program will display satellite position and rotor position. Unfortunately, the SatTrack software does not run in the background, as other rotor drivers do. This means you will see the SatTrack tracking screen instead of InstantTrack itself. Once activated, the system will always go to a "home" position of 0° elevation and 360° azimuth before starting to track an object. I found this procedure can take up to two minutes, so plan to select the satellite and start tracking a couple of minutes prior to the start of the pass. With my old 286 computer running the SatTrack software, performance of the tracking was improved by using the text version (sattrktx.exe) of the software. The graphical version seemed to require more of my computer's resources, and antenna pointing lagged behind the satellite position up to 8° on fast moving targets. This was nearly eliminated by using the text version. If you're using a faster computer this shouldn't be a factor. Also, since the beamwidth of the VHF/UHF beams I'm using is greater than 30° the small error in tracking wasn't noticeable anyway.

I have had a great time operating my newly automated antennas but there are a few things to keep in mind about this system and its limitations. First, these are lightweight TV-type rotators—they won't handle a large array and are sensitive to the balance of the antennas. Second, this system may not be the best choice if you're into digital satellite operation since the software is not compatible with the popular Wisp™ station automation software.

Additional Parts
(most available from Radio Shack™)

25.2 V 2 A transformer (RS 273-1512)
metal standoffs for board mounting
power cord
1/4 A fuses & holder
power switch
enclosure (RS 270-274)
male and female DB-9 connectors
DB-25 female connector
DB-25 male-to-male computer cable

R2 rotor cable is available from The Radio Works, P.O. Box 6159, Portsmouth VA 23703; telephone (800) 280-8327 (and other suppliers).

The software is designed to operate only with InstantTrack—no other popular software is supported although I have multi-tasked the program with my own favorite tracking program under Win95™ without any problems.

With that said, I still feel the SatTrack system is a great way to gain automatic antenna tracking—without breaking the bank. Use of this low-cost system has made working low orbit satellites, including the shuttle and *Mir*, much more enjoyable. I was even able to use the system on Field Day this year and it performed flawlessly running on battery power (with an inverter) in a portable situation. I am having a great time using my new station capabilities and I feel this system would be a great addition to any budget-minded satellite enthusiast's station. 73

73's DX Dynasty Award

This is the current list of DXDA award winners. The DX Dynasty Award is the most enjoyable DX award around. Any correspondence concerning DXDA should be addressed to DXDA, c/o *73 Magazine*, 70 Route 202 N, Peterborough NH 03458 USA.

BASIC AWARD—100 COUNTRIES WORKED

1. W1RFW
2. WB2DIN
3. KT1A
4. W3FDU
5. KA9JOL
6. WB1BVQ
7. NW7O
8. AK4H
9. W3HCW
10. KZ2W
11. K9FD
12. WD5N
13. KA9TNZ
14. K9GBN
15. N5GAP
16. WB3FMA
17. NN6E
18. AL7HG
19. N6CGB
20. KI6AN
21. K9JPI
22. N4WF
23. K6PKO
24. KW7J
25. VE6JO
26. WA4IUV
27. W4ZFE
28. N4KMY
29. WØHBH
30. K8KJN
31. KG1V
32. K1KOB
33. KY3F
34. PY2JY
35. YB5BEE
36. YB5BEH
37. WB9SBO
38. NØAFW
39. KA9MOM
40. N3II
41. W6DPD
42. KE8GG
43. VE6VK
44. KD9RD
45. W4WJJ
46. KØHSC
47. KI6GI
48. IK1APP
49. KJ4RR
50. K8MDU
51. N1EIU
52. K1DRN
53. WD8REC
54. ZL2BLC
55. VE3EFX
56. W9MCJ
57. N6IV
58. KN8D
59. KC5YQ
60. WB6ITM
61. KA2AOT
62. K4LHH
63. VE2QO
64. KE5AT
65. W9SU
66. W3OOU
67. NR2E
68. KF5PE
69. N3FBN
70. KB4SJD
71. N3EZX
72. IK8GCS
73. WB4I
74. NG1S
75. WB7UUE
76. HK4EB
77. KØBFR
78. N7GMT (KF7SH)
79. AA4VN
80. KA1LMR
81. N8AXA
82. NM2I
83. KD9YB
84. HC2CG
85. VE1BXI
86. YC2OK
87. N4GNL
88. GM3UBF
89. 5Z4BP
90. IØAOF
91. VE1BN
92. KA2NRR
93. 5Z4DU
94. KB8ZM
95. HK4CCW
96. W2JQ
97. HC2AGT
98. WD5N/M
99. VE1BHR
100. VE1AGZ
101. K5AOB
102. KW2D
103. PY3ARZ
104. WB4ETD
105. N2FPB
106. KD3CQ
107. K4NNK
108. VU2DNR
109. AA5BE
110. PY3OG
111. VE4ACF
112. VE4SI
113. PJ2KI
114. WB4CKY
115. W6EQB
116. KK4IY
117. IK1IYU
118. N8GCN
119. KB1AF
120. KB8BHE
121. KE2CG
122. VS6CT
123. G3IZQ/W
124. WB6FNI
125. KAØIAR
126. K9SM
127. W6BCQ
128. KA5MSL
129. WB4FLB
130. N7GLT
131. WAØX
132. KF4GW
133. N4QGH
134. VE1CBK
135. 7J1AAL
136. K6ICS
137. NZ7W
138. WBØN
139. WC7F
140. F6IFE
141. KL7N
142. KE8LM
143. WA6YOO
144. VE2MFD
145. N3APQ
146. HK1DBO
147. NM3V
148. IK6GFY
149. WB6UAN/M
150. NK6Z
151. KB6IUA
152. W9OKH
153. WB5FXT
154. NB3E
155. N2ESP
156. YU2EJU
157. OZ1DXX
158. IK5IIU
159. KA1ION
160. KD3AI
161. OK1AEH
162. W9LCR
163. 8P6SH
164. KA6SPQ
165. ZF2KH
166. W6MVV
167. JA8CAQ
168. KI6WF
169. K2MRB
170. AA6GM
171. JAØSU
172. NU8Z
173. GØGRK
174. YB8VM
175. DV1BRM
176. WØTU
177. N7CNH
178. PY3IO
179. YBØZCA
180. YBØAF
181. VE3PQB
182. W2SV
183. N1ADE
184. WP4AFA
185. KS7V
186. W2OFB
187. G4ASL
188. N5JUW
189. KA8WAS
190. 5NØWRE
191. AA4IP
192. JR5KDR
193. KD2WQ
194. KA3NIL
195. WA8YWK
196. VE1ACK
197. HP2XVB
198. WB5KYK
199. N5JUJ
200. N4OBJ
201. 9Q5NW
202. KW2D
203. VE1HA
204. HP8BSZ
205. IK8JJQ
206. YC3DKN
207. I3VKW
208. K2EWA
209. KD3CR
210. N9GDG
211. KF8K
212. FD1BEG
213. DU1DZA
214. N8IMZ
215. KK4YA
216. LU1JDL
217. KA8YYZ
218. KA4TMJ
219. WA9DDC
220. YI1CIS
221. YC3FNL
222. GØFWG
223. KV4B
224. N5IET
225. WA9WIG
226. N3CDA
227. KE6KT
228. IK7DBB
229. JY5EC
230. N1ETT
231. PY2DBU
232. I8IYW
233. NØISL
234. KC4BEB
235. WA7QQI
236. KA1RJG
237. OZ9BX
238. KB4HBH
239. KA3RWP
240. NJ1T
241. W4DCG
242. YCØRX
243. VE7OJ
244. AA4W
245. N9GMM
246. KB4HBH
247. KM4HF
248. CE1YI
249. KA1FVY
250. N2GVB
251. N2DAO
252. WF8E
253. YBØHZL
254. N5MBD
255. N4SNS
256. KA3TGY
257. JN3XLY
258. N4DUV
259. KA9MRU
260. KA4OTB
261. N4JED
262. AB4KA
263. WA7OET
264. KA3RVH
265. CE7ZK
266. NI9J
267. WB9PTN
268. KB8DAE
269. WØCL
270. WB7VUB
271. JF6TUU
272. ZY3IO
273. KB4VIR
274. OE6CLD
275. N7JJQ/DU3
276. KK4FB
277. DU1AUJ
278. K2EWB
279. NI5D
280. N2JXC
281. NØIWT
282. WB3BDH
283. K1CVF
284. KA3CXG
285. KA1SPO
286. WA4NWT
287. KJ4OI
288. KA3UNQ
289. WB2VMV
290. KD4MM
291. OE3DHS
292. KD9HT
293. DL8OBC
294. G3KVA
295. WA4NEL
296. KA4VZO
297. NØIDT
298. KA1FUE
299. KD7EO
300. JH8MWW

301. KB8ICD
302. JA1CKE
303. N3GEE
304. JA5MG
305. KA1FTU
306. WA8KMK
307. N2IBW
308. N4THE
309. N3CYD
310. JA4TF
311. W6YLL
312. WA1S
313. KC5WA
314. N6WK
315. PY4OY
316. KG7BO
317. WB3FQY
318. WCØA
319. VE4AMU
320. YCØMCA
321. WA3LEU
322. KB2GLO
323. OZ1FNX
324. K6GCF
325. KC4PCX
326. KA7EXD
327. DK9EA
328. HL5AP
329. SM7BRO
330. ON6DP
331. WA3KKO
332. KB9ABI
333. DA2UI
334. SMØBNK
335. WA2BMQ
336. WAØQIT
337. 5Z4BH
338. KB9ALG
339. OA4ANR
340. OD5ZZ
341. VE3ZD
342. LU2ATR
343. HL5FRG
344. UB5LRS
345. N1ICC
346. UY5XE
347. PS7AB
348. IK4NPC
349. KD1CT
350. DU1CHD
351. UB4WZA
352. LU3CF
353. G7AZP
354. VE5AAD
355. IK3ITX
356. SM4SEF
357. N9CPK
358. VE2JWK
359. N7JXS
360. KO4VO
361. JE1GWO
362. JM2DRM
363. IK1SLE
364. JF7QUE
365. HL5BUV
366. VE3GLX
367. N7QXQ
368. JE6KLR
369. KK6JY
370. N2BI
371. KK4XL
372. JA3SSB
373. KBØADI
374. I1-50156
375. VU2SMN
376. EA6AAK
377. N3IHS
378. N8MOT
379. KB2NEK
380. PY2DBU
381. WA2CKP
382. WB2PPN
383. JA1-2Ø762/BV
384. AB4ZD
385. YC8EMH
386. WA8RLB
387. N5VWM
388. VE7SKB
389. KB4BCC
390. VE7GSE
391. YC8BWN
392. KN6ER
393. KD1CJ
394. G2BFO
395. KB7ROK
396. VK2EQ
397. 4X4-2175
398. JE1BGL
399. KF2LC
400. WV2X
401. LU5EWO
402. WAØCLR
403. VO1UL
404. VE6AML
405. WD4REX
406. WAØCLR
407. VE3VJC
408. WA1MKS
409. JH6FHJ
410. JE9EMA
411. WK8X
412. TI2YLL
413. KP4WN
414. KD6MOS
415. KI7CM
416. JH1IED
417. JN6MIC
418. BU7FC
419. DL1EMO
420. KD4TWP
421. 5W1GC
422. JA7JI
423. W5RUK
424. LU3OJZ
425. WD4OHD
426. 7L1MFS
427. ON4BCM
428. WØUHL
429. N4WJV
430. LU5DSE
431. HS1NGR
432. DU1SAN
433. 4X/G3WQU
434. K3BSA
435. CP8AK

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6CGB
4. K9FD
5. NØAFW
6. N3II
7. WB1BVQ
8. KA2AOT
9. KI6G1
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/W1
19. WB6FNI
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IIU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVV
30. JA8CAQ
31. KI6WF
32. JAØSU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. WP4AFA
39. 5NØWRE
40. KD2WQ
41. VE1ACK
42. N5JUJ
43. 9Q5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. GØFWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJ1T
53. CE1YI
54. YBØHZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. NØ1DT
68. KA1TFU
69. KA4TMJ
70. JA4TF
71. KA3UNQ
72. KB8ZM
73. K2EWA
74. WA1S
75. PY4OY
76. WCØA
77. OZ1FNX
78. KA7EXD
79. ON6DP
80. VE1RJ
90. N6WK
91. WA3KKO
92. KB9ABI
93. SMØBNK
94. WAØQIT
95. 5Z4BH
96. OA4ANR
97. OD5ZZ
98. VE3ZD
99. HL5FRG
100. UB5LRS
101. PS7AB
102. KD1CT
103. DU1CHD
105. IK3ITX
106. VE2JWK
107. N7JXS
108. JM2PRM
109. HL5BUV
110. VE3GLX
111. KK6JY
112. EA6AAK
113. N3IHS
114. WA2CKP
115. VE6AML
116. WAØCLR
117. WA1MKS
118. KD6MOS
119. KP4WN
120. LU5EWO
121. 5W1GC
122. JA7JI
123. W5RUK
124. LU3OJZ
125. ON4BCM
126. WØUHL
127. N4WJV
128. LU5DSE
129. VO1UL
130. DU1SAN
131. 4X/G3WQU

200 COUNTRIES ENDORSEMENT

1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. NØAFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6CGB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5NØWRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCQ
20. CE7ZK
21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT
26. KA4TMJ
27. N7GMT
28. JA4TF
29. K2EWA
30. WA1S
31. PY4OY
32. ON6DP
33. VE1RJ
34. WA3KKO
35. WAØQIT
36. 5Z4BH
37. HL5FRG
38. JA1-2Ø762/BV
39. VE6AML
40. LU5EWO
41. 5W1GC
42. JA7JI
43. W5RUK
44. LU3OJZ
45. WØUHL
46. N4WJV
47. VO1UL
48. DU1SAN

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT
10. N7GMT
11. KD3CQ
12. KB8DAE
13. WA1S
14. PY4OY
15. VE1RJ
16. 5Z4BH
17. N2BI
18. I1-50156
19. VE6AML
20. KB8ZM
21. LU5EWO
22. JA7JI
23. W5RUK
24. WØUHL

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU
5. N7GMT
6. WA1S
7. PY4OY
8. KD3CQ
9. VE1RJ
10. UY5XE
11. IK3ITX
12. VU2SMN
13. JA7JI
14. W5RUK

350 COUNTRIES ENDORSEMENT

1. WB2DIN
2. PY4OY
3. UB4WZA
4. JA7JI
5. KD3CQ

Number 38 on your Feedback card

OFFICIAL DX DYNASTY COUNTRIES LIST: 1/98

AFGHANISTAN	YAØ
AGALEGA ISLAND	3B6
ALAND ISLANDS	OHØ
ALASKA	KL7
ALBANIA	ZA
ALGERIA	7T-7Y
AMERICAN SAMOA	KH8
AMSTERDAM AND ST PAUL ISLAND	FT5Z
ANDAMAN ISLAND	VU
ANDORRA	C3
ANGOLA	D2, D3
ANGUILLA	VP2E
ANNABON ISLAND	3CØ
ANTARCTICA	CE9, KC4
ANTIGUA	V2
ARGENTINA	LO-LW
ARMENIA	EK
ARUBA	P4
ASIATIC RUSSIA	UA-UI8, 9, Ø, RA-RZ
ASCENSION ISLAND	ZD8
AUCKLAND ISLAND	ZL9
AUSTRALIA	VK
AUSTRIA	OE
AVES ISLAND	YVØ
AZERBAIJAN	4J, 4K
AZORES ISLANDS	CU
BAHAMA ISLANDS	C6
BAHRAIN	A9
BAKER ISLAND	KH1
BALEARIC ISLANDS	EA6-EH6
BANABA ISLAND	T33
BANGLADESH	S2
BARBADOS	8P
BARBUDA	V2
BELARUS	EU-EW
BELGIUM	ON-OT
BELIZE	V3
BELAU (W. CAROLINE I.)	KC6, T8
BENIN	TY
BERMUDA	VP9
BHUTAN	A5
BOLIVIA	CP
BONAIRE, CURACAO	PJ2,4,9
BOTSWANA	A2
BOVET ISLAND	3Y
BRAZIL	PP-PY
BRIT CYPRUS	ZC4
BRITISH VIRGIN ISLANDS	VP2V
BRUNEI	V8
BOSNIA-HERZEGOVINA	T9
BOUVET	3Y
BULGARIA	LZ
BURKINA FASO	XT
BURUNDI	9U
CAMBODIA	XU
CAMEROON	TJ
CAMPBELL ISLAND	ZL9
CANADA	VE, VO, VY
CANARY ISLANDS	EA8-EH8
CAPE VERDE ISLANDS	D4
CAYMAN ISLANDS	ZF
CENTRAL AFRICA	TL
CENTRAL KIRIBATI	T31
CEUTA AND MELILLA	EA9-EH9
CHAD	TT
CHAGOS	VQ9
CHATHAM ISLAND	ZL7
CHILE	CA-CE
CHINA	BY, BT
CHRISTMAS ISLAND	VK9X
CLIPPERTON ISLAND	FO
COCOS ISLAND	TI9
COCOS-KEELING ISLAND	VK9C
COLOMBIA	HJ, HK
COMOROS	D6
CONGO	TN
CONWAY REEF	3D2
COOK ISLAND	ZK1
CORSICA	TK
COSTA RICA	TI, TE
CRETE	SV9
CROATIA	9A
CROZET ISLAND	FT5W
CUBA	CM, CO
CURACAO	PJ
CYPRUS	5B
CZECH REPUBLIC	OK, OL
DENMARK	OZ
DESECHEO ISLAND	KP5
DJIBOUTI	J2
DODECANESE ISLANDS	SV5
DOMINICA	J7
DOMINICAN REPUBLIC	HI
EASTER ISLAND	CEØ; Y
EAST KIRIBATI	T32
EAST MALAYSIA	9M6, 9M8
ECUADOR	HC, HD
EGYPT	SU
EL SALVADOR	YS
ENGLAND	G, GX, M
EQUATORIAL GUINEA	3C
ESTONIA	ES
ERITREA	E3
ETHIOPIA	ET
EUROPA ISLAND	FR/E
EUROPEAN RUSSIA	UA-UI1, 3, 4, 6, RA-RZ
FALKLAND ISLANDS	VP8
FAROE ISLANDS	OY
FERNANDO DE NORONHA	PPØ, PYØ
FIJI ISLANDS	3D2
FINLAND	OF-OI
FRANCE	F
FRANZ JOSEPH LAND	R1FJ
FRENCH GUIANA	FY
FRENCH POLYNESIA	FO
FUTUNA ISLAND	FW
GABON	TR

GALAPAGOS ISLAND	HC8, HD8
GAMBIA	C5
GEORGIA	4L
GERMANY (FED REP OF)	DA-DL, Y2-Y9
GHANA	9G
GIBRALTAR	ZB2
GLORIOSO ISLAND	FR/G
GOUGH ISLAND	ZD9
GOZO ISLAND	9H
GREECE	SV-SZ
GREENLAND	OX
GRENADA	J3
GUADELOUPE	FG
GUAM	KH2
GUANTANAMO BAY	KG4
GUATEMALA	TG, TD
GUERNSEY	GU, GP, MU
GUINEA	3X
GUINEA-BISSAU	J5
GUYANA	8R
HAITI	HH
HAWAII	KH6, KH7
HEARD ISLAND	VKØ
HONDURAS	HQ, HR
HONG KONG	VS6, VR2
HOWLAND ISLAND	KH1
HUNGARY	HA, HG
ICELAND	TF
INDIA	VU
INDONESIA	YE-YH
IRAN	EP, EQ
IRAQ	YI
IRELAND	EI, EJ
ISLE OF MAN	GD, GT, MD
ISRAEL	4X, 4Z
ITALY	I
ITU GENEVA	4U_ITU
IVORY COAST	TU
JAMAICA	6Y
JAN MAYEN ISLAND	JX
JAPAN	JA-JS
JARVIS ISLAND	KH5
JERSEY	GJ, GH, MJ
JOHNSTON ISLAND	KH3
JORDAN	JY
JUAN DE NOVA ISLAND	FR/J
JUAN FERNANDEZ ISLAND	CEØ; Z
KALININGRAD	UA2
KAZAKHSTAN	UN-UQ
KENYA	5Y-5Z
KERGUELEN ISLAND	FT5X
KERMADEC ISLAND	ZL8
KINGMAN REEF	KH5K
KURE ISLAND	KH7K
KUWAIT	9K
KYRGYZSTAN	EX
LACCADIVE ISLANDS	VU
LAOS	XW
LATVIA	YL
LEBANON	OD
LESOTHO	7P
LIBERIA	EL
LIBYA	5A
LIECHTENSTEIN	HBØ
LITHUANIA	LY
LORD HOWE ISLAND	VK9L
LUXEMBOURG	LX
MACAO	XX9
MACEDONIA	Z3
MACQUARIE ISLAND	VKØ
MADAGASCAR	5R-5S
MADEIRA ISLAND	CT3
MALAWI	7Q
MALDIVE ISLANDS	8Q
MALI	TZ
MALPELO	HKØ
MALTA	9H
MALYJ-VYSTOSKIJ (M-V) ISLAND	R1MV
MARIANA ISLAND	KHØ
MARION ISLAND	ZS8
MARKET REEF	OHØ; M
MARSHALL ISLAND	V7
MARTINIQUE	FM
MAURITANIA	5T
MAURITIUS ISLAND	3B8
MAYOTTE	FH
MELLISH REEF	VK9M
MEXICO	XA-XI
MICRONESIA	V6
MIDWAY ISLAND	KH4
MINAMI-TORI-SHIMA	JD1
MOLDOVA	ER
MONACO	3A
MONGOLIA	JT-JV
MONTSERRAT	VP2M
MOROCCO	CN
MOUNT ATHOS	SV/A
MOZAMBIQUE	C8-9
MYANMAR	XY, XZ
NAMIBIA	V5
NAURU	C2
NAVASSA ISLAND	KP1
NEPAL	9N
NETHERLANDS	PA-PI
NETHERLANDS ANTILLES	PJ
NEVIS ISLAND	V4
NEW CALEDONIA	FK
NEW ZEALAND	ZL, ZM
NICARAGUA	YN
NICOBAR ISLAND	VU
NIGER	5U
NIGERIA	5N, 5O
NIUE ISLAND	ZK2
NORFOLK ISLAND	VK9N
NORTH COOK I.	ZK1
NORTH KOREA	P5
NORTHERN IRELAND	GI, GN, MI
NORWAY	LA-LN
OGASAWARA ISLAND	JD1
OMAN	A4
PAKISTAN	AP-AS
PALMYRA ISLAND	KH5

PANAMA ..... HO, HP
PAPUA NEW GUINEA P2
PARAGUAY ..... ZP
PERU ..... OA-OC
PETER 1ST ISLAND 3Y
PHILIPPINES ..... DU-DZ
PHOENIX T31
PITCAIRN ISLAND VR6
POLAND ..... SN-SR
PORTUGAL ..... CT
PRATAS I. BV9P
PRINCE EDWARD ISLAND ZS8
PRINCIPE S9
PROVIDENCIA ISLAND ..... HKØ
PUERTO RICO KP3, KP4
QATAR A7
REUNION ISLAND ..... FR
REVILLA GIGEDO ISLAND XA4-XI4
RODRIGUEZ ISLAND 3B9
ROMANIA ..... YO-YR
ROTUMA ISLAND 3D2
RWANDA 9X
SABLE ISLAND ..... CYØ
SAN ANDRES ISLAND ..... HKØ
SAN FELIX AND SAN AMBROSIO ..... CEØ; X
SAN MARINO T7
SAO TOME S9
SARDINIA ..... ISØ,IMØ
SAUDIA ARABIA ..... HZ
SCARBOROUGH REEF BS7
SCOTLAND ..... GM, GS, MM
SENEGAL 6V, 6W
SEYCHELLES S7
SIERRA LEONE 9L
SINGAPORE 9V
SINT MAARTEN, SABA, AND SINT EUSTATIUS ISLANDS PJ5-8
SLOVAK REPUBLIC ..... OM
SLOVENIA S5
SMOM (MALTA) 1AØ
SOCOTRA ISLAND 7O
SOLOMON ISLANDS H4
SOMALIA T5
SOUTH AFRICA ..... ZR-ZU
SOUTH COOK I. ZK1
SOUTHERN SUDAN ..... STØ
SOUTH GEORGIA ISLAND ..... VP8, LU
SOUTH KOREA ..... HL, DS
SOUTH ORKNEY ISLAND ..... VP8, LU
SOUTH SANDWICH ISLAND ..... VP8, LU
SOUTH SHETLAND ISLAND ..... VP8, LU, CE9, HFØ, 4K1
SPAIN ..... EA-EH
SPRATLY ISLAND 1S
SRI LANKA 4P-4S
ST BRANDON ISLAND 3B7
ST HELENA ISLAND ZD7
ST KITTS V4
ST LUCIA J6
ST MARTIN ISLAND ..... FJ
ST PETER AND ST PAUL ROCKS ..... PPØ-PYØ
ST PIERRE ISLAND AND MIQUELON ..... FP
ST PAUL ISLAND CY9
ST VINCENT J8
SUDAN ..... ST
SURINAME ..... PZ
SUVA 3D2
SVALBARD ISLAND ..... JW
SWAZILAND 3DA
SWEDEN ..... SA-SM
SWITZERLAND ..... HB
SYRIA ..... YK
TADZHIK ..... UJ
TAIWAN ..... BV
TAJIKISTAN ..... EY
TANZANIA 5H, 5I
TASMANIA VK7
THAILAND ..... HS, E2
TOGO 5V
TOKELAU ZK3
TONGA ISLAND A3
TRINDADE AND MARTIM VAZ ..... PPØ, PYØ
TRINIDAD & TOBAGO 9Y-9Z
TRISTAN DE CUNHA ZD9
TROMELIN ISLAND ..... FR/T
TUNISIA 3V
TURKEY ..... TA-TC
TURKMENISTAN ..... EZ
TURKS AND CAICOS ISLANDS VP5
TUVALU T2
UGANDA 5X
UKRAINE ..... UR-UZ, EM-EO
UNITED ARAB EMIRATES A6
UNITED KINGDOM SOV BASES ON CYPRUS ZC4
UNITED NATIONS-GENEVA 4U1
UNITED NATIONS-NEW YORK ..... 4U_UN
UNITED NATIONS-VIENNA 4U1
UNITED STATES OF AMERICA ..... K, W, N, AA-AK
URUGUAY ..... CV-CX
UZBEKISTAN ..... UJ-UM
VANUATU ..... YJ
VATICAN CITY ..... HV
VENEZUELA ..... YV-YY
VIETNAM ..... 3W, XV
VIRGIN ISLANDS KP2
WAKE ISLAND KH9
WALES ..... GC, GW, MW
WALLIS ISLAND ..... FW
WAYNE GREEN W2NSD
WESTERN CAROLINE ISLAND (BELAU) KC6, T8
WEST KIRIBATI (GILBERT I.) T3Ø
WESTERN SAHARA ..... SØ
WESTERN SAMOA 5W
WEST MALAYSIA 9M2, 9M4
WILLIS ISLAND VK9W
WORLD BANK 4U1
YEMEN 7O
YUGOSLAVIA ..... YT, YU, YZ
YUKON VY1
ZAIRE 9Q-9T
ZAMBIA 9I, 9J
ZANZIBAR 5H1
ZIMBABWE Z2

The index and/or table of contents has been removed and photographed separately within this volume year.

For roll film users, this information for the current volume year is at the beginning of the microfilm. For a prior year volume, this information is at the end of the microfilm.

For microfiche users, the index and/or contents is contained on a separate fiche.

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the April issue, we should receive it by January 31. Provide a clear, concise summary of the essential details about your Special Event.

JAN 10

LOVELAND, CO The Northern Colorado ARC will host their "Superfest" 9 a.m.–3 p.m. at the Larimer County Fairgrounds, 700 Railroad Avenue. VE exams, commercial exhibits, computer and radio goodies, more. Reserve tables from *Jeanene Gage NØYHY, (970) 351-7327.* For general info, call *(970) 352-5304.* Talk-in is on 145.115(-) 100 Hz, or 146.85(-).

JAN 17

HAMMOND, LA The Southeast Louisiana ARC, Inc., will hold the SELARC Hamfest at Southeastern Louisiana University, University Center, upper level. There will be adequate display space under climate controlled conditions, with multiple meeting rooms and excellent parking. Inclined ramps to the exhibition level will ensure easy loading and unloading. All commercial tables, $20. Swap tables, $10. No admission fee. This event will not allow flea market or craft items unless they are amateur radio or computer-related. Contact *SELARC, Inc. (Hamfest 98), P.O. Box 1324, Hammond LA 70404-1324.*

ST. JOSEPH, MO The 8th annual Northwest Missouri Winter Hamfest will be held on Jan. 17th, 1998, 9 a.m.–4 p.m., at the Ramada Inn in St. Joseph MO, with special room rates for hamfest participants. The event is being co-sponsored by the Missouri Valley ARC, Green-Hills ARC and Ray-Clay ARC. The motel is located at I-29 and Frederick Ave. (exit 47 on I-29). Talk-in on 146.85 and 444.925. VE exams, major exhibitors, and flea market all indoors. Free parking. Advance tickets $2 ea. or 3/$5; at the door $3 ea. or 2/$5. Pre-reg. requests received after Jan. 8th will be held at the door. Swap tables $9 ea. first 2 tables. Commercial exhibitors are welcome. Write for details to *Northwest Missouri Winter Hamfest, c/o Gaylen Pearson WBØW, 1210 Midyett Road, St. Joseph MO 64506.*

JAN 18

RICHMOND, VA The Richmond Amateur Telecommunications Society (RATS) will hold "Frostfest 98" 8:30 a.m.–3:30 p.m. at the Showplace, 3000 Mechanicsville Tpke. I-95 exit 75 to I-64 east, then exit 192 (Rt. 360 East), go 1/2 mi. on left. Forums, flea market, handicapped accessible. Talk-in on 146.88. Admission $6. Contact *Todd or Amy McCoy, (804) 330-3165,* or write *P.O. Box 35021, Richmond VA 23235.* For info, call *(804) 739-2269, ext 3378.* Check the Internet at [http://frostfest.rats.net].

YONKERS, NY The Metro 70 cm Network will hold an Electronic Flea Market, 9 a.m.–3 p.m., at Lincoln High School, Kneeland Ave., Yonkers NY. Free parking. Indoor flea market. No tailgating. VE exams. New and used equipment for CB operators, amateur radio operators, commercial two-way radios, computers, stereo buffs, televisions, telephones, electronic parts and kits, and much more, will be on sale. Admission is $6 for adults; children under 12, accompanied by an adult, are admitted free. For information, or to register as a vendor, call *Otto Supliski WB2SLQ at (914) 969-1053.* Talk-in on 449.425 MHz pl 156.7; 223.760 MHz pl 67.0; 146.910 MHz; and 443.350 MHz pl 156.7. Mail paid reservations to *Metro 70 CM Network, 53 Hayward St., Yonkers NY 10704.*

JAN 24

GALLATIN, TN The Tennessee Valley Amateur Radio Network will hold its 8th annual Hamfest and Computer Show at the Gallatin Civic Center. Setup Fri. 5–9 p.m., Sat. 5–8 p.m. Open Sat., 8 a.m.–2 p.m. Tables $10. Adm. $5, XYLs and under 16 free. Talk-in on 147.90/.30 T 114.8. Food available. Free parking, handicapped accessible. VE exams by pre-registration only. Send 610, copy of license or certificate of successful completion, and an SASE to *Ronnie Gilley, 512 Hillside Dr., Gallatin TN 37066.* For hamfest info, contact *Bill Ferrell, 1253 Woodvale Dr., Gallatin TN 37066;* or *phone (615) 451-5992* and leave a message.

JAN 25

DOVER, OH The Tusco ARC Hamfest will be held 8 a.m.–1 p.m. at Ohio National Guard Armory, 2800 North Wooster Ave., Dover OH. Admission $2 at the door. Dealers admitted at no charge. Tables $8 each. Bring your own extension cords. Reservation deadline is Jan. 11th. Remember to include an SASE. Setup at 6 a.m. ARES forum. Remit to *Tusco ARC, c/o Howard Blind KD8KF, 6288 Echo Lake Road NE, New Philadelphia OH 44663.*

VILLA PARK, IL The Wheaton Community Radio Amateurs will hold their 31st annual mid-winter Hamfest on Super Bowl Sunday, Jan. 25th, 1998. It will be held at the Odeum Exposition Center, 8 a.m.–2 p.m. Tickets are $6 in advance (with four prize stubs), or $8 at the door (with one prize stub). Advance tickets may be purchased by sending a business-size SASE to *WCRA, P.O. Box QSL, Wheaton IL 60189.* Free off-site parking and bus service is included in the ticket price. All flea market tables by reservation; please call *(630) 545-9950.* For commercial area info, call *(630) 545-9950;* or fax *(630) 629-7098.* Talk-in on 145.390(-). VE exams will be held on-site. Take a look at the Web site at [www.w9ccu.org].

JAN 31

ALBUQUERQUE, NM The Del Norte High School parking lot, at the corners of Montgomery and San Mateo Blvds., is the location for the Albuquerque Winter Tailgate Swapfest. This event will be open 8 a.m.–2 p.m. (depending on the weather), and admission is free. For more info, please contact *Tom Ellis K5TEE, 912 Lomas Ct. NE, Albuquerque NM 87112-5515; phone (505) 291-8122.*

LOCKPORT, NY The Lockport Amateur Radio Assn. will hold its 37th annual Winter Auction at 3 p.m. at the Niagara County Cooperative Extension, Lake Ave. (Rt. 78), 1/4 mile north of the city of Lockport. Admission is $4. Talk-in on 146.82(-) W2RUI rptr. Contact Floyd King WA2ZVL, (716) 434-1533. See the Web page at [http://www.localnet.com/~ae2t/lara/auction.html].

FEB 2

PHOENIX, AZ An amateur radio equipment auction will be held by the West Valley ARC at St. Clement of Rome Catholic Church Social Hall, 15800 Del Webb Blvd., Sun City AZ. Free admission. The club keeps 10% on equipment sales. Talk-in on 147.30+. Contact *George N7JSA at (602) 933-0854, or E-mail [watgl@juno.com].*

FEB 8

LATROBE, PA The Chestnut Ridge ARC Hamfest/Computer Show will be held 8 a.m.–3 p.m. at the American Legion, 1811 Ligonier Street in Latrobe. Take Route 30 to Route 982 North. Follow signs. Talk-in on 145.15(-) K3JDU rptr. Send payments to *CRARC, Box 175, Loyalhanna PA 15661-0175.*

MANSFIELD, OH The Mansfield Mid-Winter Hamfest/Computer Show will be held at the Richland County Fairgrounds in Mansfield, starting at 7 a.m. Tickets $4 in advance, $5 at the door. Tables $9 in advance, $12 at the door, if available. Reservation deadline is Jan. 15th. Talk-in on 146.34/.94 W8WE. For info, advance tickets/tables, send SASE to *Pat Ackerman N8YOB, 63 N. Illinois Ave., Mansfield OH 44905;* or phone *(419) 589-7133 after 6 p.m. EST.*

FEB 21–22

CINCINNATI, OH The 17th annual Great Lakes Division and Computer Convention (formerly Cincinnati ARRL 1998), will be held at Cincinnati Gardens and

Continued on page 81

QRP

Low Power Operation

Michael Bryce WB8VGE
955 Manchester Avenue SW
North Lawrence OH 44666
[prosolar@sssnet.com]

It's hard to find a low-power enthusiast who has not at one time either owned or operated a Heathkit HW-8. This rig is a classic. I don't know right off how many HW-8s Heath sold, but it had to be many thousands. The HW-8 is still sought after, though the Heathkit company has long retired from the kit business.

Having said that, let's look at some of the common problems you may encounter if you're a newcomer to the HW-8.

Do the VFO tango

The HW-8 uses a simple VFO. The VFO is controlled by a variable capacitor mounted in the center of the PC board. A vernier drive couples the VFO's shaft to the main tuning knob. A stock HW-8 does not have RIT built in.

There are three basic problems with the HW-8 VFO: linearity, calibration, and broken or damaged VFO capacitor plates. Let's take the broken VFO capacitor plates first because the capacitor must be in good condition before we can attempt to adjust the VFO.

Like most variable capacitors, the one used in the HW-8 has its rotor plates press fit into the movable shaft. Turning the main tuning knob, from stop to stop, causes the rotor to be either fully meshed or fully unmeshed. To keep the rotor plates from shorting out against each other, small separators are used. The only mechanical stops are the rotor plates themselves. If you try to turn past these stops, two things happen. One, the separators break, and two, one or more of the rotor's plates come out of the shaft. So, if you run the main tuning capacitor past its stop, and keep on cranking, you'll ruin the VFO capacitor. Now you're probably thinking, "What a half-assed design that is." Well, to be fair to Heath, it's not really that bad. For you see, the vernier drive is supposed to prevent damage to the VFO capacitor by slipping at the end of travel.

But the HW-8 is heading on 25 years old. Most of the grease inside the vernier drive has long since dried out. With no grease (or very little), the drive now has too much friction and will allow you to rip out the guts of the VFO capacitor.

Fixing the damage

The best fix would be to install a new VFO capacitor. However, as far as I know, there are no replacement parts left. I doubt Heathkit had the VFO custom made, so it's a good bet it's a standard part—somewhere! But where? I don't have a clue.

You can repair the capacitor, however, although forget about setting the VFO for linearity from one end to the other. And to be sure, the VFO will no longer be accurate—but the fix will allow you to put the HW-8 back on the air.

First, remove the main tuning knob and the vernier drive. You'll need to completely strip the HW-8 of its front panel. You'll need to remove the plastic VFO dial. Use caution, as this dial will be fragile. Over time, the plastic becomes brittle.

The drive is fastened to the VFO shaft with a set screw. There are two small screws holding the vernier drive to the chassis. Remove these and slide the vernier drive off the VFO shaft.

Disassemble the vernier drive by unscrewing the part with the flanges from the smaller shaft end. Look for a spine nut on the drive. You'll need a very small screwdriver to back out the nut. When the drive is apart, you'll see several ball bearings and an internal flange. This flange rides on the bearings.

Now, clean out any old grease you see. Apply a small amount of new grease (I use electrical grease in a small squeeze tube available from Mouser™ or Digi-Key™). Don't overdo the greasing. Too much is worse than too little!

Reassemble the drive. You can try out the drive by holding one of the ears of the larger end in a small vise while turning the shaft end with your fingers. The output side should move, but at a much slower rate than the input side.

Stop the output side while still turning the input. The output shaft should slip with a slight amount of drag. If you're happy with the results, wipe any excess grease from the vernier and set it aside.

Fixing the capacitor

You need to remove the VFO capacitor from the rig. With the capacitor removed, carefully inspect the rotor plates for damage. A loose plate is one thing; a damaged plate is an entirely different matter. If you're lucky, maybe one or two plates have become loose.

With very fine needlenose pliers or a tweezers, grab the loose plate at its bottom. If you try to push the plate in from the top, you'll buckle it! The idea is to hold the plate as close to the point of entry of the shaft as possible. This will prevent the plate from distorting. It's a good idea to hold the capacitor's body in a small vise so you can have both hands free.

Generally, you don't need to force the plates back into their slots. They go in kinda easy.

It should also be common sense to everyone, but use caution while working on the loose plates. The more mangled the plates, the more trouble you'll have later on.

The plates are held in the shaft by friction. But once they are forced out (by running them into the stops) they won't stay in after you replace them. The fix is kinda radical. Glue 'em in! I've used two-part epoxy glue to hold the plates in. From the QRP-L list, BAH uses BAH with good results.

It's almost impossible to put the dislodged plates in straight, so I use some cardboard to hold the plates in their correct position until the epoxy sets. The idea here is to allow the cardboard to hold the plates straight until the epoxy sets, but not to glue the cardboard in by mistake!

Be sure to keep the epoxy away from the bearings on the capacitor. Use *only* enough epoxy to hold the plates. Too much will cause damage to the capacitor's shaft.

Allow plenty of time for the epoxy to set up. Don't rush the job. Most epoxy glues require at least 24 hours of cure time.

Putting everything back together

With the glue cured, rotate the capacitor's plates and be sure that none of the movable plates hit the stationary plates. Use your multimeter, set on continuity, to check for any shorts between the plates while you slowly rotate the capacitor through its range. The plates should be as straight as possible. If you've been careful, you should have a working capacitor once more. Reassemble the capacitor and drive once more into the rig.

It's a good bet the VFO will be way out of whack. The best place to start is by coupling a frequency counter to the output of the VFO—a great place to sneak a signal from L9. A few turns of hookup wire wrapped around L9's shield will work. If you want a more direct connection, place your counter's probe on the emitter lead of Q3. Transistor Q3 is the emitter follower for the VFO.

THE DIGITAL PORT

Jack Heller KB7NO
712 Highland Street
Carson City NV 89703
[jheller@sierra.net]

Innovative packet programs and SSTV

Several readers have asked whether the BayPac™ BP-2M modem will send and receive slow scan television (SSTV). The answer is simply ... yes. How to do it is, as in many of our computer encounters, a little more complex—there's a definite learning curve.

When I purchased the BP-2M, several pieces of software were included: The BayCom DOS-based software for packet, HamComm 3.1, and JVFAX. I must admit I had not given much thought to using a FAX program and so I didn't load the JVFAX program until the questions came.

Being unfamiliar with the program's capabilities, I checked some listings for working SSTV with a modem and JVFAX popped up in several places along with other programs professing to do the job. So I loaded the program, which is another DOS one, not intended to run under Windows™.

There is a configuration procedure to follow which asks for information that most of us either don't know or have forgotten about our computers. After exerting about all the forces of my patience, I got the information "pretty close." I tuned the radio to 14.230 and, sure enough, there were some strange warbles that sounded like I had struck gold.

Putting it to the test

In all the time I have been a ham, this was my first experience with SSTV, so this was a true test to see if the software was user-friendly. As the hams on frequency were discussing the images and how they had captured and edited them, I could sense an enthusiasm that instantly made me eager to see this thing work.

At first, it was necessary to go back and tweak the configuration. After about the third tweak, I got close enough to receive black and white images on my screen. After dancing in the street to celebrate my success, it was time to determine what it would take to capture the color that was certainly a part of these images.

As I mentioned, deciphering all the parameter requests had already been a test, but with the knowledge that it could be made to work, my energy was renewed. I got right in the middle of the process and it looked like I was headed the right way when a small disaster struck. The program crashed.

***Photo A.** A chicken in the radio? This is what Hank KH6DEH considers a typical Hawaiian scene. This image was received under less than best conditions and off the back of my beam. He had one of the stronger signals during the test period as the band was about to fold for the day.*

I thought it was just one of those things where a reboot would bring the program back to normal. Not so. It would be necessary to reload the program. I had done it in.

Continued on page 52

The VFO operates from a frequency of 8.645 MHz to 8.895 MHz. In theory, you want the VFO to track from 8.895 to 8.645. You do this by adjusting L9 and C302B. Again, in theory, you run the VFO to the high end; adjust L9. Run the VFO to the low end and adjust C302B. You keep doing this until the VFO operates exactly from 8.895 to 8.645. In theory! A brand-new stock HW-8 may be able to pull this off, but one 20 years old never will. And if your VFO has been glued together, forget it!

If you can't seem to put the VFO back on frequency, try gently moving one or more rotor plates. It won't take much, so use a plastic probe and push on a plate while the counter is displaying the VFO output frequency.

It's best if you just plan on placing the VFO tracking to favor one end of the band. This is very important if you had to repair the VFO capacitor.

If you have picked up a used HW-8, with a damaged VFO, a few voltage tests in the VFO area would be a good idea. Without the VFO running, the HW-8 won't receive or transmit!

At the junction of ZD1 and R33 (with 12 volts applied to the rig and the power turned on) you should see 9.1 volts. The collector of Q3 will be at 12 volts while the base sits at 1.5 volts. The source lead of Q2 should be 1.15 volts. Remember that your readings could be off by as much as 20 percent and still be correct.

Since the HW-8 is a direct conversion design, a lot depends on the VFO. Even if you had to repair the VFO capacitor, all is not lost. This is an easy rig to fix. Next month, we'll look at some of the switching problems the HW-8 faces and a few of the most popular modifications you can do to this low-power workhorse. 73

This meant installing the program and going through the configuration from scratch. I should have kept notes ... a lesson in hindsight. It was the end of a relatively satisfying session and time to get away from the computer for a bit. As I sat back and thought about the dilemma, I remembered seeing other software available. If it was necessary to start over, perhaps it would be just as well to stretch my learning capacity and look at something new.

More choices

I went to an HF-FAX Web site I had bookmarked in Netscape™ [http://ourworld.compuserve.com/homepages/HFFAX/hf-fax.htm], and found a dozen or more DOS programs and (surprise!) several SSTV programs to run under Windows. I read the descriptions of the Windows-based programs and selected W95SSTV for download.

It's a healthy size, on the order of three megabytes, as would be expected for a Windows program. It's well worth the on-line time to download. When you install it, you get the feel of a finished professional Windows 95™ program. It simply takes care of itself. The configuration is intuitive and accomplished in a few minutes.

No modem!

Now here's the kicker. It does not require a modem or any such external hardware. You *do* need a sound card. A 32-bit Sound Blaster™ card is preferred. I am still using a 16-bit SB card and it works fairly well. Also it's recommended to have better definition than my 256-color display, but that, too, works okay for now.

The hookup is simple. Cable your audio from your radio to the line-in jack on the sound card and make a cable from the line-out to the modulator input terminal on the AFSK connector on your radio. The good part is there is a detailed explanation of what to do and watch for in the documentation that accompanies the program. I like that.

The cost of trying it out for yourself? The program is shareware. It works 100%, not crippled, except it only works with bitmap (BMP) images until registered. Registration is $50. The cables were nominal. Along with some used cable (most any cable will suffice for audio) I had already, it was necessary to invest in some new plugs. I was started in SSTV with color for less than $10! I *really* like that.

I'll pass along a little hint, though it is covered in the instructions. It applies to getting enough audio drive for a modem as well as the sound board. Audio output isn't the same from every jack on most radios. I find the drive from the Accessory Port on the ICOM 735 is insufficient for the task at hand.

Measuring with a digital voltmeter, the output is consistently under one volt AC. The output from the headphone jack, which of course varies with volume control setting, can be pushed as high as seven volts AC. You only need about two volts more or less and the system will start to make pictures on your monitor.

Go for smoke

With the cables in the right places, the system was ready for a test drive. The manual leads you through a relatively brief testing, setup and orientation. Then you're ready for the real thing.

It was the right time of day and a group of hams were gathered at the 14.230 SSTV watering hole. The first picture received was coming through in color, and I was still learning to operate the program, so part of the image was not displayed.

It didn't take long to get the hang of which button to click at what time and the program started receiving images automatically. As I mentioned, my monitor and sound board are considered inferior, but the images are still pretty good, considering.

For example, some of the scenic images sent on SSTV are far from the norm, as can be seen in **Photo A**. You will find quite a variety of scenes that are candidates for serious photo exhibits. Of interest is the fact that on the HF bands, you can receive images anywhere in the world that you can copy an audio signal reasonably well. That is because the audio signal is the medium into which the video is coded. That may be a poor choice of words, but the point is that this method is necessary to make the transmission possible within the width of the HF bands. By contrast, check the extreme bandwidths of commercial TV broadcasts.

I found, after a time, that the quality of the received images could be improved by adjusting the passband tuning on the ICOM 735. I also made attempts with the external audio filter but the help was barely perceptible. The best answer is probably a DSP system—another item on my wish list.

Will it transmit?

I captured and stored one of Hank KH6DEH's many scenic images and retransmitted it to see if this part of the system really worked. I had previously transmitted into a dummy load and it appeared to work, but I needed confirmation that there was a real picture going out into the airwaves. Hank assured me the picture came through "loud and clear."

Transmit and receive is accomplished from a screen in the W95SSTV program. There is a pop-up editor that allows you to insert your callsign and other information into the image. The spectral display is an effective tuning help and gives an idea of signal quality as well as the interference at hand.

W95SSTV is a winner

The installation and successful operation of the program was definitely one of the smoothest transitions from bottom-rung-of-the-ladder to nearly flawless operation. The program screen is intuitive, although there were a few minutes of delay while I made up for the parts of the documentation I had skimmed through a bit too rapidly.

Packet on a sound board

Now for another thought along these lines. There is a Web site on the Internet with a downloadable set of modules to accomplish packet using the sound board also. No modem, no TNC—it appears the wheel has been reinvented. It doesn't look nearly as easy as the W95SSTV, and it will be a while before most of us get it sorted out, but it certainly deserves a look-see. Point your browser at [www.ife.ee.ethz.ch/~sailer/pcf/].

In retrospect, it appears to me that the digital communications format will blossom with many software innovations that will be as remarkable as the TNC was in the 1980s. That was quite a breakthrough for ham radio. It made it possible for hams of modest means to participate in a worldwide digital network. There have been some gains in speed and efficiency, but ham radio is overdue when we compare the 1200-baud rate to the speeds landline file transfers are attaining.

Don't be surprised if ham radio, once again, leads the way to more efficient and affordable means of communication. Some of the greatest minds work to ascend mental mountains "because they are there." Ham radio is a great outlet for those minds.

Lest I forget to pass it along, a few of you have informed me that shielding was necessary for your BP-2M modem to radio cable. Both Zak VK6BMZ and Jeff N3EPS claimed problems were solved on HF as well as VHF. The tech at TigerTronics™ says this shouldn't be necessary when using the cable supplied with the modem. So take it for what it is worth—if it works for you, it must be right.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. On packet, when you get a chance, drop me a line [KB7NO @ N7NPB.#NONEV.NV.USA.NOAM]. For now, 73, Jack KB7NO. 73

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors Inc.
P.O. Box 131646
Staten Island NY 10313-0006

Mayor's proclamation for hams

The people who live in the borough of Staten Island, New York, consider themselves lucky to have a big number of amateur radio operators who are very civic-minded. There is a dedicated group of hams who belong to ARES headed up by my friend Charlie Hargrove N2NOV. They believe that their responsibility to Part 97 of the FCC Rules and Regulations is to provide "value to the public for emergency communications."

Our ARES group in Staten Island has provided communications for walk-a-thons, parades, floods, and the New York City Marathon. In September of 1997, Charlie was thrilled to get an E-mail message from Howard Price KA2QPJ, of the local ABC News affiliate, saying that he was able to get the ear of Mayor Giuliani's press secretary to have His Honor sign a proclamation for Amateur Radio Awareness Day (September 20th).

Within less than 24 hours of getting this message, Charlie had arranged for seven Staten Island ARES members to readjust their schedules to be able to attend the mayor's presentation to us at City Hall. I myself was proud to have been invited, and quickly arranged for a substitute teacher to cover my radio classes that day. My principal, Barbara Glasman, was delighted to see our school and its ham radio program represented at the proclamation ceremony.

There were 13 amateur radio operators in all from New York City who were present at the famous "blue room" of City Hall on the morning of September 19th. Pictures were taken, hands were shaken, and smiles were in abundance. Mayor Giuliani expressed his appreciation of the work that amateur radio volunteers do to help out the MOEM (Mayor's Office of Emergency Management). [As of this writing, by the way, the communications command station at the MOEM just received its custom callsign from the FCC: WC2OEM.]

Photo A. *Proudly displaying Mayor Giuliani's proclamation are, shown left to right: Jerry Cudmore K2JRC; Frank Katalenas N2UMC; Howard Price KA2QPJ; Matt Evans WA2UKM; Jerome Hauer, Director, OEM; Charles Hargrove N2NOV; Karen Hargrove N2ZYF; John Kiernan KE2UN; and Beverly Dyrack KA2OPQ.*

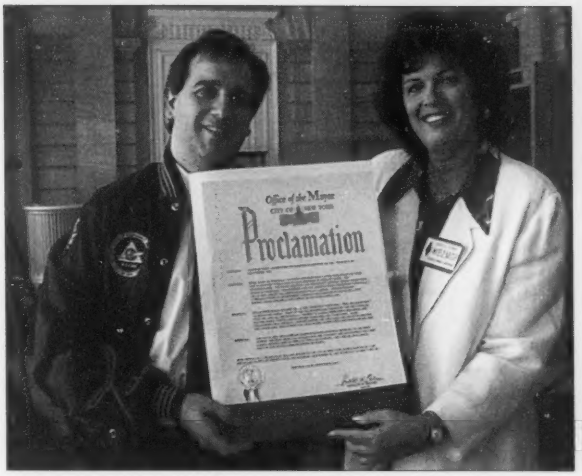


Photo B. *It's a good day to be a ham! At least Howard Price KA2QPJ and Carole Perry WB2MGP think so. Photos by Charles Hargrove N2NOV.*

The Mayor then read from the proclamation to us:

"Whereas: More than 100 federally licensed amateur radio operators dedicate their time to support public and private agencies in times of crisis. Two organizations—The Radio Amateur Civil Emergency Service under the Mayor's Office of Emergency Management and the Amateur Radio Emergency Service, a volunteer arm of the American Radio Relay League—provide backup communications to government agencies and disaster relief in the event normal radio channels are disrupted or overloaded; and Whereas: Volunteers work around the clock, donating their skill, time and equipment to serve the public. Many of the volunteers are trained by the Red Cross in first aid, and all are specially trained to handle emergency messages and routine radio traffic under intense deadlines and conditions. These volunteers have recently worked during the TWA flight 800 disaster and for Red Cross shelters opened for safe havens during weather emergencies; and Whereas: Our city's vast and complex communications system is indebted to the many trained amateur radio volunteers who are efficient and dependable and lend a much-needed hand in times of crisis or disaster. They are an invaluable part of our city's communications network. Now therefore, I, Rudolph Giuliani, Mayor of The City of New York, in recognition of this important event, do hereby proclaim Saturday, September 20th, 1997 in The City of New York as 'Amateur Radio Awareness Day.'"

The Director in the mayor's office for MOEM is Jerome Hauer, who was also in attendance at the signing. The hams on hand for this exciting event were: Howard Price KA2QPJ, Jerry Cudmore K2JRC, Charles Hargrove N2NOV, Karen Hargrove N2ZYF, Arthur Booten N2ZRC, John Kiernan KE2UN, Matt Evans WA2UKM, Rich Dyrack K2LUQ, Beverly Dyrack KA2OPQ, Bill Butler N2BGR, Frank Katalenas N2UMC, Carole Perry W2MGP, and Scott Swanson N9SAT. 73

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083

Last year at this time the launch of Phase 3D, the largest and most advanced amateur radio satellite, was supposedly only a few months away. Circumstances have proven otherwise. The satellite has been structurally modified for greater than anticipated launch stresses, is heavier, and still has a few outstanding construction issues in search of resolution. Phase 3D was the primary topic of the 1997 AMSAT Annual Meeting and Space Symposium held in Toronto, Ontario, over the weekend of October 17th through the 20th.

The AMSAT annual meeting

Over 200 satellite enthusiasts went to Canada to hear the latest news about Phase 3D, listen to presentations on other hamsat topics, attend the AMSAT Board of Directors meeting, and tour the city of Toronto. AMSAT meetings are typically held wherever the local volunteers have the interest and infrastructure necessary to host the event. In 1996 we went to Tucson, Arizona. This year it was Toronto, and next year it will be Vicksburg, Mississippi.

The space symposium

Activities began in earnest on Friday morning at 8 a.m. Many attendees made it a point to arrive on Thursday to ensure they would miss nothing.

Chuck Duey KIØAG got things started with his presentation about mobile and portable operations via voice-mode satellites. Chuck has been active on several low-orbit satellites including Fuji-OSCARs 20 and 29, RS-10, and AMRAD-OSCAR-27. He uses the Arrow Antenna™ model 146/437-10 dual-band yagi with an integral low-power duplexer for two-meter and 70-cm activity. Using this antenna with a dual-band HT, Chuck managed several contacts on a single pass via A-O-27 from the Delta Hotel parking lot (**Photo A**) to augment his excellent talk.

Many stations have made short contacts via A-O-27 using only dual-band whip antennas on HTs, but the addition of a good yagi makes a marked difference. During Chuck's parking-lot demonstration, downlink signals on 70 cm were strong and the two-meter, three-watt output from Chuck's HT appreciated the additional uplink gain of the beam.

Most of Arrow's antennas are made from aluminum arrow shafts with threaded inserts for easy takedown, setup and portability. Plastic element tips are included for safety. The antennas are engineered for maximum gain and efficiency in the smallest practical size and lightest weight. Chuck's presentation and on-the-air demonstrations were quite a hit at the symposium.

Other talks on Friday morning included Ashley Rego of SPAR Aerospace describing the New Canada Arm designed for the International Space Station; an introduction to microwave work by Laura Halliday VE7LDH; Bdale Garbee's discussion on how the Internet and free software actually help AMSAT; WATOO™—new Internet access software for satellite tracking by Marc Normandeau, Jean-Marc Desbiens, Michel Barbeau, and Steve Bernier; and finally a discussion by Rich Moseson W2VU, explaining the use of the Weather Channel™ as a model of satellite technology for newcomers.

The Friday afternoon talks were dominated with software topics in addition to some solid hardware discussions by Ken Ernandes N2WWD and Fred Winter on a new EZ-SAT™ proposal and Dr. Robert E. Zee's presentation on the University of Toronto's astronomy microsatellite project.

Anthony Montiero AA2TX described an object-oriented approach to automatic radio tuning. John Hansen WAØPTV delineated the use of broadcast protocols on terrestrial links. While many groups around the country have considered the efficiency of the satellite-based, digital, 9600-baud broadcast protocol on the UoSATs and KITSATs, the software has not been openly available. Doug Quagliana KA2UPW showed the advantages of a simple BPSK (bi-phase shift keying) modulation system implemented with software and minimal hardware and John Melton GØORX went into his efforts to develop non-machine-specific software using Java™. Robert Hillman finished Friday's talks with his notes on the design of a space imaging processing system.

Friday evening provided a great opportunity to renew acquaintances and get into some late-night discussions and friendly arguments on technical and political hamsat topics.

Photo A. *Chuck Duey KIØAG gave a talk on mobile and portable hamsat operation in addition to making several AMRAD-OSCAR-27 QSOs outside the convention hotel. Harry JA1ANG looks on.*

Photo B. *Lou McFadin W5DID and Stan Wood WA4NFY provided a Phase 3D progress report at the 1997 AMSAT Space Symposium in Toronto, Ontario.*

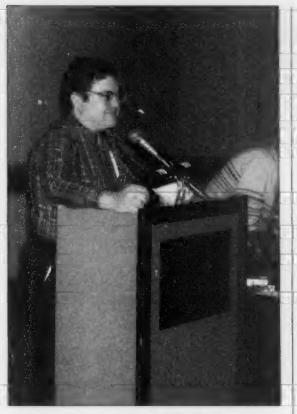


***Photo C.** Dan Schultz N8FGV presented a paper on digital voice modulation techniques for a future generation of hamsats.*

Saturday

Activities on Saturday began promptly at 8 a.m. AMSAT President Bill Tynan provided opening remarks and a welcome. After the preliminaries were out of the way, the topic of interest, Phase 3D, was addressed. Bill told the audience about the difficulties AMSAT had been through, meeting the launch stress requirements from the European Space Agency for the *Ariane 502* flight scheduled for 1997. AMSAT could not make the structural modifications to Phase 3D and prepare all of the transponders, experiments and support equipment in time to match the ESA's launch agenda.

AMSAT Payload Integration Manager Lou McFadin W5DID (**Photo B**), and AMSAT Vice President of Engineering Stan Wood WA4NFY joined Bill at the podium to detail the efforts at the AMSAT lab in Orlando, Florida, over the past year. Lou showed videotape documenting the many mechanical components needed to strengthen the structure of the satellite. Overhead slides were used to point out the high stress points that required work. Stan described many other activities at the lab in support of the project. During the year payloads from around the world were brought to Orlando for final integration and testing.

AMSAT Executive Vice President Keith Baker KB1SF brought the group up to date on the financial status of AMSAT North America. Until launch, expenses supporting the program will continue. While AMSAT is not currently tight for money, any significant delays or further surprises, like the projected launch stresses and required space frame modifications, will cause serious problems. Bill pointed out that talks with the ESA about another launch opportunity will not begin until the completion of the *Ariane 502* mission.

The Phase 3D presentation engaged a large segment of the morning. Other talks before lunch included the design and implementation of Internet-linked ground stations for the amateur satellite community by Chris Bond and Mark Maier; a Phase-4 "lite" proposal by Philip Chien KC4YER; a Phase 3D GPS receiver progress report by Bdale Garbee N3EUA; and finally a practical guide to Phase 3D operation on Mode L (1.2 GHz) and above by Ed Krome K9EK. Ed has provided many simple solutions to complex digital and microwave challenges over many years.

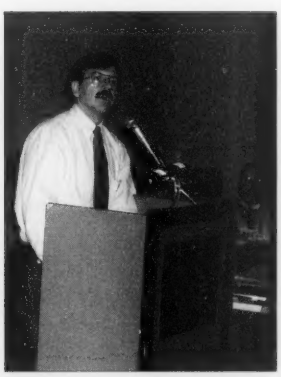


***Photo D.** Frank Bauer KA3HDO provided insight on the Amateur Radio gear for the new International Space Station.*

***Photo E.** Hans van de Groenendaal ZS5AKV, IARU Satellite Advisor and Member of the IARU Region 1 Executive Committee, provided an excellent speech at the AMSAT banquet on Saturday night.*

During the symposium days, the Delta Hotel restaurant did an excellent job. Saturday lunch was no exception. Service was quick and the prices were reasonable. We were back in the meeting room on time for Dan Schultz's description of digital voice modulation techniques for a future generation of ham satellites (**Photo C**). Martin Davidoff K2UBC, author of *The Satellite Experimenter's Handbook*, followed with his thoughts on selecting orbits for LEO (low earth orbit) constellations and SSB/CW satellite communications. Ken Ernandes N2WWD continued the thread with his description of a candidate orbit for future AMSAT spacecraft.

AMSAT Vice President for Manned Space Activities Frank Bauer KA3HDO provided details on the amateur radio opportunities on board the future International Space Station (**Photo D**). The proposals for two feet of rack space dedicated to ham gear were accepted by NASA. Frank will be working with his recently-formed group of hams from participating countries to plan and build the equipment and antennas for the ISS.

Following the talks, an hour was allocated for the AMSAT General Meeting. All of the AMSAT officers and board members took the stage to provide information to the membership about their programs and projects. It was also an opportunity for the members to ask questions. The Phase 3D topic was good for a few more queries.

The official activities of the day ended with an excellent banquet; a talk about the future of amateur satellite frequency allocations by IARU Satellite Advisor Hans van de Groenendaal ZS5AKV (**Photo E**); plaque presentations by Bill Tynan and other AMSAT officers; and the

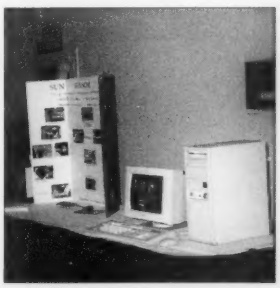


***Photo F.** One of the display demonstrations at the AMSAT Space Symposium.*

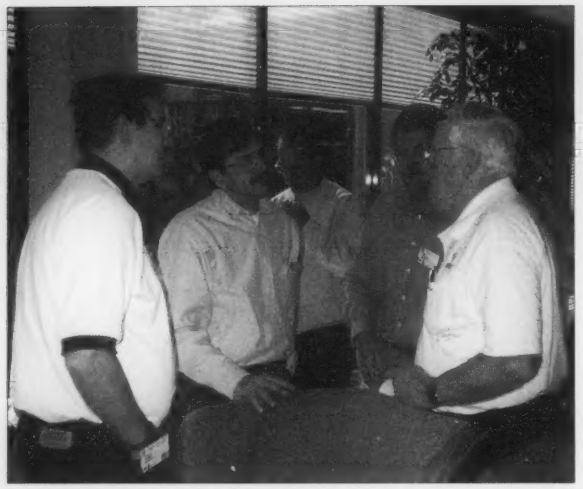


***Photo G.** TAPR President Greg Jones WD5IVD (left), AMSAT President Bill Tynan W3XO (right) and others take a break at the AMSAT Space Symposium in Toronto, Ontario.*

prize drawings. This year ICOM America™, Rosetta Laboratories™ of Australia, and Kenwood Canada™ provided the top prizes. The odds of winning were excellent, with over 100 other items ranging from a Kansas City Tracker Tuner™ to ESA T-shirts.

Sunday

AMSAT Vice President of Field Operations Barry Baines WD4ASW hosted an Area Coordinators' breakfast at 7:30 a.m. AMSAT currently has over 150 volunteer area coordinators who make presentations to ham clubs and offer assistance to those that would like to participate in hamsat activities. Barry's efforts to support the field volunteers has paid off. Many coordinators join the ranks every month to help promote this facet of amateur radio activity.

The remainder of Sunday morning was dominated by the IARU meeting. Satellite frequency coordination efforts were discussed in addition to many other topics. Debate was encouraged on preparation for WRC99, frequency allocations challenges from Africa, and the use of amateur satellites by third parties engaged in emergency communications.

While many symposium attendees took off for home on Sunday afternoon, the AMSAT Board of Directors meeting was just beginning. Bill Tynan's agenda set a tough pace. The Sunday session lasted till 10:30 p.m. An early start on Monday allowed an end by about 3:30 p.m. A transcript of the discussions and motions will be printed in an upcoming issue of *The AMSAT Journal*.

The Toronto volunteers did a fantastic job with the 1997 AMSAT Space Symposium and General Meeting. The Vicksburg, Mississippi, group will have a really hard act to follow. Perhaps by this time next year Phase 3D will finally be in orbit. The project, now seven years old, has been the most challenging one to date.

Note: You can find Arrow Antenna on the Internet at [http://Members.aol.com/Arrow146/index.html]. Their E-mail address is [Arrow146@aol.com]. The standard mail address is 1803 S. Greeley Hwy. #B, Cheyenne WY 82007. Their phone number is (307) 638-2369, and the FAX line is (307) 638-3521.

On the Go

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4
1011 Peacock Ave. NE
Palm Bay FL 32907
[pangen@compuserve.com]

Plan to plan

What do you do in an emergency? Naturally, that depends upon what type of emergency you're faced with. We teach our children to stop, drop, and roll if they ever catch their clothing on fire. It's a simple plan that can save a child's life. But what about the type of emergency you may be called upon to support as a ham radio operator? Do you have a plan for that? Many people assume that they will merely grab their handie-talkie, head to where the action is, and talk on the radio. In many cases, this is not the best idea.

A friend of mine used to always quote the "six P" rule, that "Poor Planning Produces Poor Performance." I know there are only five Ps—use your imagination for the sixth. If you have no idea what you're going to do in an emergency situation such as a natural disaster, you are counting much too heavily on luck and divine intervention.

Planning for emergencies and disasters is a tricky business, because by definition, a disaster or an emergency is unexpected. By the same token, a plan is a series of ideas which may be appropriate for a given situation. Most plans begin changing as soon as they are implemented. However, they do provide the skeletal structure, and a starting point.

The military has operational plans for virtually any possible conflict, and when an event occurs, the appropriate plan is retrieved and set into motion. Warfare has many of the aspects of a disaster, plus the added problem of the bad guys' army or navy trying to make things as difficult as possible.

There's a lesson to be learned here. In most cases, in the event of an emergency which would involve the use of the amateur radio community, a number of other organizations would be involved. These would include the police and fire departments, possibly the area Civil Defense authority (often called the Office of Emergency Preparedness or such), and relief agencies,

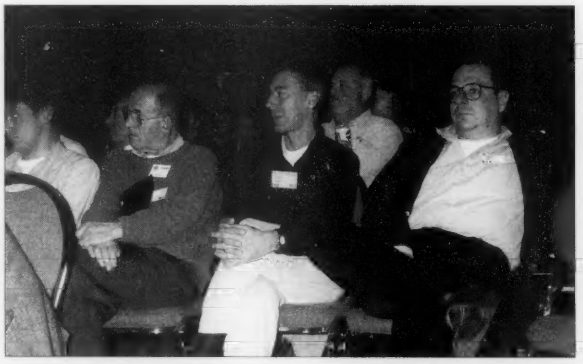


***Photo H.** Alberto Zagni I2KBD (center) of ITAMSAT and other members of AMSAT Italy attended the AMSAT Space Symposium and ARISS (Amateur Radio on the International Space Symposium) meetings.* 73

such as the Red Cross. While some hams are deeply involved with these agencies on a regular basis, most do not perceive the need to get involved until a crisis occurs. We need to plan a little better.

Developing a plan can be as simple as using the old mantra of newspaper reporters, "Who, What, When, Where, and How?" The "Who?" question covers several categories. Ideally, the Emergency Coordinator and his or her primary assistants will cover key areas, such as the Civil Defense Office, the Red Cross office, and so forth. If these key people know their responsibilities, and have an existing relationship with the people they are going to be working with, you have a significant advantage. An experienced ham with these skills can determine what the served agency needs, and then assign other hams to appropriate duties to meet these needs. A cadre of experienced operators is the key to a successful operation.

"What?" can be defined as "What support will we be providing?" Traditionally, this has included providing inter-agency communications so that there is a direct and immediate link among groups which may not be able to communicate directly. The local police, for example, may not be able to communicate with the National Guard, so hams can provide that service. Another common need is for hams to provide communications at emergency shelters, or to provide communications for those conducting damage assessment.

"When?" may seem an easy one... "when the disaster strikes." Unfortunately, the time frame for providing communications often extends for days, or in some cases, longer. There is often a surplus of willing volunteers the day the disaster strikes, but it quickly dwindles as time passes. A good plan will include identifying those who may be available for longer periods, or determining some folks who should be held back so they can be involved on the third through fifth days, rather than using everybody on day one. Many people can get a day or two off from work for such activities, but if everyone uses up their time early on, it gets difficult later. If you have hams who are retired or have the freedom to determine their own schedules, these folks can be invaluable for the longer haul.

"Where?" is always difficult, because we never know where a disaster will strike. However, it is not as difficult as it would appear. In many cases, there will be people needed for damage assessment, shelter operations, etc. If a ham takes the time to train with a particular agency for a role, he or she is a natural for that particular type of location.

The Red Cross provides training in damage assessment and emergency shelter management. A ham can function both as a damage assessor or shelter manager and his or her own communicator if the training was completed.

Likewise, if a ham operator is a reservist, it would make sense to assign that individual to be the liaison with the National Guard. A National Guard member may or may not be available to do communications, depending upon what duty is required of him or her.

"How?" is the toughest one, because it is the link to all the other questions. Unlike the reporter, we are not concerned with what has happened, but are more concerned with what *will* happen. This is the sum and substance of your plan.

Planning is important. In his book *It Doesn't Take A Hero*, General Schwartzkopf pointed out that he fought in three wars, and they were in the last three places he ever would have expected when he graduated from West Point. The lesson here is that we all need to plan as best we can, because what we will face may be totally unexpected.

Get involved, now. Think about going through a damage assessment or shelter management class, and while you're there, learn CPR and first aid. Work with the area's Emergency Coordinator, and get involved with the folks you'd meet during an emergency. It's only a matter of time until you meet them. We should put at least as much time into planning for a disaster as we do planning our vacations!

As the robot said in the movie *Short Circuit*, "Input! I need input!" Let me know your ideas, suggestions, etc. Use E-mail, snail-mail, whatever. Your ideas are very important! Besides, now that I'm settled into my new home, I always love to get good mail besides the usual bills. Happy New Year! 73

Ask Kaboom

Your Tech Answer Man

Michael J. Geier KB1UM
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

Sound!

Although we hams send video, computer data, Morse code and more over the air, more than anything else, we send voice. It makes sense, because voice is the normal human mode of communication, and most people find it easiest and fastest. Besides, we're just plain comfortable with it. What could be more natural?

In order to get your voice across the ether to another ham, you have to have all kinds of things, including a radio, antenna, license, electricity, usable ionospheric propagation, and so on. Between your voice and your radio is the microphone, and its characteristics matter a great deal. This month, let's look at issues regarding audio, because, ultimately, sound is what it's all about!

Not hi-fi

Chances are, you own some kind of audio equipment, be it a portable headphone stereo, a full-blown audiophile monster system or, more likely, something in between. Especially with CDs so popular, everyone is getting accustomed to hearing essentially perfect, noise-free sound all the time. Not that long ago, FM stereo was considered "hi-fi," and a good LP (remember those?) seemed nothing short of amazing. By today's standards, though, FM stereo is good enough only for listening to in the car, and the vinyl record seems so noisy that many people can't stand it at all. As our ears get trained, we are bothered by things we used to ignore. It's much the same with visual stimuli. Take computers: Do you remember when the Apple II's graphics were considered high resolution and looked fabulous? We all loved the games and animation—wow, they were even in color—but we would find them primitive and hard to take in today's world of Super VGA and Macintosh graphics.

Undoubtedly, you've noticed that amateur radio doesn't sound anything like what you're used to hearing, even on the AM broadcast band, let alone FM stereo. The fact is, ham radio just isn't hi-fi. That's not some kind of sloppiness on our parts, though—it's deliberate! As it happens, commercial two-way and public service radios don't sound any better. Why would we want to make our communications systems sound less than great? In one word, economy.

Squeeze 'em in

No, I don't mean that we want to make our radios cheap! In fact, ham radio gear isn't cheap at all. Most of it costs a lot and is made very well. I'm referring to the spectrum cost of sending high-fidelity information. The wider the audio frequency response you send, the more bandwidth you use up. Recognizing this, the FCC has deemed that our voice signals shall have no more than 3 kHz of frequency response. To give you an idea of how little that is, a telephone gives you 5 kHz, FM stereo goes to 15 kHz, and a CD player goes to 20 kHz, which is about the limit of human hearing with a good, young set of ears that hasn't yet been ruined by overexposure to loud rock music. For many middle-aged people, 12-15 kHz is the upper limit, while some elderly folks, and many rock musicians, often can't hear over about 8 kHz on a good day.

Other factors

There's more to audio fidelity than frequency response, though. Two other big factors are noise and distortion. On both of these issues, two-way radio gear falls short of the hi-fi mark, too. On HF, signals usually refract off the ionosphere when long distances are involved. Nature being the imperfect lady she is, the steadiness of that refraction is poor, resulting in fading, blasting and other maladies. So much for hi-fi audio.

On VHF/UHF, things are a little better. Up there, we usually use FM, which is capable of darned good audio. Communication distances tend to stick to line-of-sight range, so ionospheric disturbance is pretty much nonexistent. So, why don't our walkies and mobiles sound like commercial broadcast radio? For one thing, we use very narrowband FM deviation (modulation), which goes farther for a given amount of power and lets more stations share the band. The drawback is that, even with strong signals, it is noisier than wideband deviation, because the tiny wobbles and noises present in the transmitted signal represent a bigger percentage of the total modulation, making the receiver interpret them as louder sounds during demodulation.

Intelligibility

We really don't mean for two-way radio to exhibit hi-fi sound. Rather, we're after another goal: intelligibility. That just means the most understandable reception of speech, even under bad conditions. It would seem intuitive that the most intelligible signal would be the one with the highest fidelity, but it doesn't work out that way. As it happens, you can do things to speech signals that make them sound worse but also make them easier to understand through noise and fading. These processes are a kind of deliberate distortion. Let's look at a few:

Getting flattened

On HF, a very popular form of intelligibility enhancement is called "speech processing." This process takes the voice signal and amplifies it in a circuit until the peaks are clipped off. Then, the signal is filtered to remove most of the harmonics and other wideband noise which results from such clipping. The result is that the softer sounds in speech are brought up to a level almost equal to the louder ones. At the receiving end, it sounds a little peculiar, but it makes it much easier to hear the speaker's softer syllables, which hold many clues to understanding words. A processed signal can often be clearly heard when an unprocessed one would be hard to decipher. By the way, hams tend to fall into one of two categories: They either love speech processors or they hate them! That's a result of many hams' pushing the processing too far by turning up the processor control toward maximum, thinking that more processing means more "talk power," or intelligibility. The resulting sound is grating to the ear. Heck, on some radios you can turn it up so much that the distortion products aren't completely removed, resulting in an RF signal that's way too wide to be legal and annoys hams on adjacent frequencies as far away as 10 or 20 kHz. We call it "splatter."

Getting squashed

Another form of intelligibility enhancement used on HF is compression. This is something like the automatic volume control on a cassette recorder, only faster. This one "rides the volume control" fast enough to keep it fairly constant between spoken syllables. Although it doesn't create the kind of distortion you get with speech processing, it still sounds weird if

pushed too far. Its ultimate effect is similar to the clipping system, in that it equalizes the levels of loud and soft sounds. It's not quite as effective in punching through noise, though, so clipping is still preferred by most hams, despite its often-realized potential for ugliness.

Up yonder

These forms of processing are used on HF, not VHF or UHF. Why don't we use them there? For the most part, they just aren't necessary. Our use of FM for most VHF/UHF work, along with the much lower atmospheric noise in that part of the spectrum, lets us have clean enough sound to begin with that we just don't need to crud it up with deliberate distortions. Besides, with weak signals on FM, adding extra modulation can have the opposite effect it has on AM and SSB; it can make your signal drop into the mud. Most rigs in these frequency ranges do employ a small bit of compression, just to keep the signal within prescribed modulation limits, but that's about it. So why do they often sound so different?

The ear

Your radio's ear is its microphone. Given the essentially low-fidelity nature of the ham radio medium, what possible difference could the mike make? More than you might think! True, the upper frequency response of just about any microphone is greater than our measly 3 kHz, so that doesn't matter. The low frequency response does matter somewhat, but SSB radios cut off below about 200 Hz, so you're still not talking about that much difference. What's left?

Between the lines

Imagine a graph with a line on the left representing 200 Hz, and a line on the right representing 3 kHz. Between those two points, you can draw a heck of a lot of different curves and wiggles. Different microphones have frequency response curves that can vary quite a bit. Let's look at a few:

Condenser mikes, used on all FM walkie-talkies and many HF radios these days, have the flattest curves of all. That means they interpret your voice pretty honestly. Is that good? On VHF/UHF FM, they sound nice. Remember, with this mode we aren't so concerned with punching through noise—we just want clear sound. On HF, though, condenser mikes tend to sound "bassy," which means the lower frequency response is too strong. In fact, it is the correct response, it just isn't the one we find most desirable. Thanks to the structure of the human vocal system and ear, many clues which help intelligibility are located in the 2–3 kHz range. By reducing the lower frequencies, we can make the radio appear to increase the upper ones, much like turning your stereo's bass down makes it seem like there's too much treble. Thus, less-bassy mikes are desirable.

Ceramic mikes are often used to achieve that "peaky," trebly sound DXers love so much. These mikes have a natural response curve that rises with frequency, giving them that punch. To simulate the ceramic-mike sound, some newer radios have a "high boost" switch which increases the treble sounds at about the same rate as a ceramic mike.

Dynamic mikes, which are magnet/coil combinations almost exactly like speakers, also have a rising response curve. Theirs is not so dramatic, though. Older FM rigs used them, but they were replaced by the now-common condenser mikes, which are smaller and cheaper. Also, dynamic mikes sometimes have very poor low-frequency response, so much so that some have a "yelling down a hollow tube" quality many people find annoying. I've heard some on HF that were pretty hard to take.

Well, I hope you've enjoyed this little sojourn down the audio path. Until next time, 73 de KB1UM. 73

ABOVE & BEYOND

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119
[clhough@pacbell.net]

Frequency counters and accuracy

There are so many different types of frequency counters out there in the marketplace, it can be a very confusing venture trying to pick out one for personal use. Helping to make the shopping trip a hassle are the various types for portable, stationary, general, workbench, and laboratory use. All of these categories provide industrial types as well as consumer types, with the differences being price and features.

It's like going to Baskin Robbins™, as there are at least as many varieties in frequency counters available for the amateur radio operator to choose from. In spite of all this possible selection the choices are not all that difficult. I thought I would devote this month's column to covering some frequency counter attributes, giving you a measurement device to grade the unit you might be thinking of purchasing. Don't think that these are absolute, as there will usually be some personal criteria you'll want to address.

When we go shopping for a piece of frequency measurement test equipment, we have most likely defined what we are willing to spend. Cost seems to be the most important feature in any consideration.

Well, then, there are several frequency counters, available new from a multitude of suppliers, aimed at the amateur and commercial markets.

What these small portable hand-held frequency counters all have in common is battery operation and frequency measurements capability to about 2000 MHz (2 GHz). Displays vary; plasma, LED and LCD are most common. Maximum frequency of operation varies from unit to unit, with most working to 500 MHz and some of the higher-end units functioning to over 2 GHz.

Most units have optional higher stability clock crystal oscillators available at an additional cost. What these higher-accuracy oscillators do is to improve accuracy performance in measurements. What do we mean by "improve" frequency measurements? Well, before we select a unit off our local dealer's shelves, let's see what it will provide for us in terms of operation.

Let's start by establishing a few objectives. Factors we will examine will be frequency error on measurements, and sensitivity. Sensitivity is the easiest to define. Most of us want something that we can fit with an antenna or rubber ducky type of antenna; key our HT on low power nearby (or separated by some five to 10 feet); and get a suitable reading on the frequency counter. For others of us sensitivity means minimum signal sensitivity, in dB.

Minimum signal in dB can be something in the -10 dB range for most inexpensive counters in the $200 or so range. In this application you would be testing frequency with an oscilloscope *times 10* or *times 1* probe, and making direct connection to low-power oscillators to determine their frequency output.

Most all small-frequency counters can be used in either of these two methods, and work well as far as sensitivity goes. If you need more sensitivity to work with very low-level signals, an external MMIC RF preamplifier could be easily constructed, just like using the preamp on a receiver.

In my shack I have collected several amplifiers that cover a multitude of frequency ranges. Some are only good to the low frequency of 60 MHz and below. These have proven quite valuable in looking at very low-level circuits, on not only the frequency counters, but a low-sensitivity spectrum analyzer. Units that are wide-bandwidth to a GHz or so can be very helpful to improve performance at these higher microwave frequencies, where counter sensitivity is decreased, as compared to its lower-frequency operation.

The next point to consider is frequency accuracy. This can be a touchy subject, as there are so many different answers in how manufacturers post this information, making it somewhat hard to compare different units. Let's discuss what's going on before we continue on accuracy.

Any frequency counter depends on a clock or internal local oscillator that is used as a standard. The accuracy of this standard, internal to the counter, determines how accurately the counter can read frequency. This one point, frequency meter accuracy, has led to many arguments and conjectures. The problem is that the frequency counter readout reads a frequency no matter how accurate a time base standard you have. The problem lies in knowing whose frequency meter is correct, or what the margin of error is, on each counter used in these tests.

Let's look at a few scenarios using different-type stability local oscillators and see just what happens. It doesn't matter whose frequency counter you apply this test to, as it's the same for all of them, be it commercial (Hewlett Packard, Systron Downer), or inexpensive battery-operated amateur-type counters.

There are many different methods used to state frequency meter accuracy. Some state accuracy expressed as 1 ppm, or high-accuracy units rated at .1 ppm. Other specifications state ± 2 hertz at 1 MHz. Another might state the accuracy to be one part in 10 to the ninth power (1 part in 10^9). How then do you make comparisons when you are faced with apples, oranges, and *pears?* What do these numbers mean? How do you compare them on an equal footing?

The equal footing is in the standard crystal oscillator, as I said before. Let's assume, for example, that we are capable of measuring this oscillator with a perfect frequency counter—no error at all. If we measure a 10 MHz oscillator and find its frequency to be 9.999980 MHz,

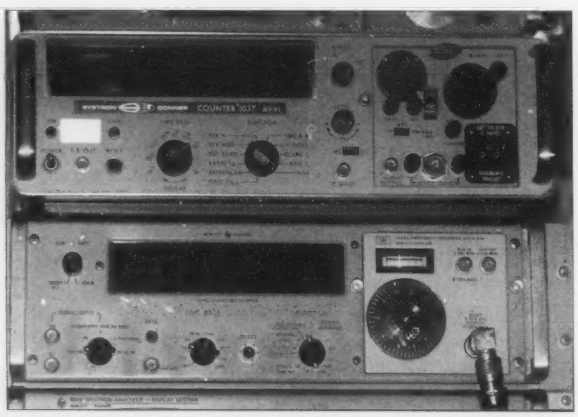


Photo A. *The old reliable HP-5245 base counter on bottom, shown with the Systron Downer 1037 on top. Not a match but quite similar in operation for main units and plug-in units. (Note: Plug-ins not interchangeable between units.)*

this would be indicative of the oscillator spec that states its stability to be ± 2 Hz per MHz. We read the frequency to be 20 Hz, low in frequency, with a spec of 2 Hz per MHz. Translating that to 10 MHz would be 2 Hz times 10 MHz or 20 Hz—and that could be either high or low. Quite an error.

If you were to read a frequency of 145 MHz with such a counter, whose time base had a 2 Hz per MHz error, the final error translated to 145 MHz would be almost 300 Hz off frequency. Evaluating the frequency counter whose time base oscillator was 1 ppm yields errors at 145 MHz to be a 145 Hz error. That is one part per million, or 1 Hz error in 1 MHz—so for 145 MHz the error could be 145 Hz.

Some new frequency counter manufacturers provide (for an extra sum) a "high-accuracy time base crystal oscillator" with stability in the .1 ppm range. Measuring the same 145 MHz frequency with a .1 ppm time base results in errors of 14.5 Hz. It's getting closer to being ideal. The more tightly the time base is controlled to an exact frequency, the better—or the less error the frequency counter will read.

Now let's cover some premium frequency counters. As you can imagine, commercial operators cannot tolerate these kinds of errors. It just won't do to set high-frequency equipment and have an offset in frequency due to the accuracy of the frequency counter. Commercial time base oscillators are quite accurate. By accurate I mean more like the one part in 10 to the ninth or so. What does that mean in ppm (parts per megahertz)? Well, that's .001 ppm basic time base accuracy; or, stated another way, that's 1/1000 of a Hz at 1 MHz.

If the accuracy was .1 Hz per MHz that's the same as 1/10th Hz per MHz, or .01 Hz per MHz is the same as 1/100 Hz per MHz. That is getting very accurate for the workbench or ham shack. Transferring this into atomic frequency standards, this is a drop in the bucket; they are capable of one part in 10 to the 12th—that's .000001 Hz per MHz. This is getting serious here in terms of accuracy.

How much accuracy do we need to have a good frequency counter? Well, the question can be best answered by cash cost basis. The more accurate units tend to be more expensive. There are exceptions to this rule, in that surplus military and swap meets might yield a suitable surplus/used frequency counter of high accuracy.

Accuracy for most any amateur project up to 500 MHz is easily satisfied with a .1 ppm frequency accuracy. I have several 1 ppm units in my shack, and, knowing that they give readings with errors of 1 Hz per megahertz, I adjust to them and don't rely on them for exact readings, but close indications or checks are suitable.

It's more important that you know what is going on and what your possible errors may be—then they become manageable.

On the other hand, it's not all rosy with a very high-accuracy frequency counter, as to keep things in tow you must have a calibration source, to verify how accurate your counter time base is, and adjust it accordingly. They all drift at different rates and must be monitored and adjusted to keep them accurate. A very expensive counter with an excellent time base that hasn't been calibrated in several years or months will be off frequency an amount that is somewhat predictable as time progresses.

The crystal time base oscillator ages and in this process changes its frequency with time. A small tweak on a variable capacitor in the circuit is needed to bring the unit back in calibration. I have watched my units drift over several months' time. I first set the unit to within 5 millihertz by making a phase tracking run for 10 hours with WWVB on 60 kHz for exact calibration. In the months that followed I observed a slow low-frequency drift in frequency that after one year totaled 25 to 35 millihertz lower in frequency than when I started.

This kind of error is not bad at all, but points out the needed calibration on any frequency counter, be it a high-accuracy unit or a lower-accuracy one. The lower-accuracy units tend to drift about and will make large changes in frequency due to varying temperature and voltage

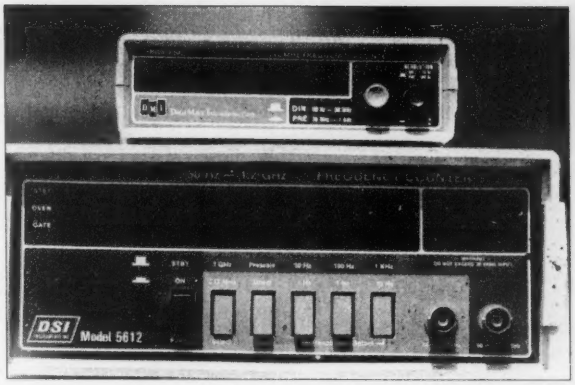


Photo B. *DigiMax 500 MHz frequency counter with older DSI (Digital Signal Instruments Co.) which became DigiMax. Quite good battery-operation portable counters good to 1 ppm.*

variations. Higher-accuracy units can take advantage of TCXOs (temperature-compensated crystal oscillators) and greater stability. Oven-type crystal oscillators are even better once they reach temperature stability, as they hold the crystal in a fixed temperature.

There is still room to gain on stability here. Some of the very high-quality crystal standards (time base oscillators) are of the oven heater type but take a different turn. They are constructed with a very slow-acting time constant oven circuit. This oven circuit is usually covered by insulation and has a second temperature-controlled double-insulated oven over the first unit. The purpose of the two ovens is to provide increased temperature stability to the crystal, protecting it from very small temperature changes.

This entire two-oven heater system is then inserted into a high stability temperature compartment, which is very much like a wide-mouth small thermos bottle. The open end of the bottle is sealed, making the temperature controls an internal function within the confines of the thermos bottle for increased temperature stability. The outer oven heats to a fixed temperature with a much faster time constant.

After 24 to 48 hours both ovens reach temperature stability inside the vacuum bottle and hold the crystal to a precise temperature that changes very little with external effects impressed on the unit. Of course, we are talking about a high quality frequency standard of secondary accuracy to the primary located at WWV and WWVB and the NIST department of standards.

What type of counter do you purchase?

The bottom line for frequency counters, now that you are prepped on the accuracy of them, is to go shopping and see what you can find that will fill your requirements. Determine how high in frequency you need to measure, and to what accuracy—then you are going to have to decide on either commercial surplus (or military surplus) vs. new counters offered for sale.

There is much to say for older counters that were made by Hewlett Packard and Systron Downer (and quite a few others). The HP-5245 is quite good to 50 MHz by itself, and with a range of plug-ins, will extend frequency capability to 18 GHz. The same is true for the Systron Downer 1037 series which is similar to the HP 5245. A new arrival on the surplus market is the HP-5328a which is nice but only goes to 500 MHz. I have observed several of these counters being offered for $100 at swap meets in (alleged) working condition. Try them out before purchasing, using your HT and a paper clip, if needed, to check them out. If they pass this test you can't go too far wrong.

A very nice Systron Downer counter is the 6036 which is a low-profile (one inch high) counter sporting direct readout to 12 GHz. Saw a few of these being offered for $150 each, in as-is condition, at our local surplus dealer. Picked up one for experimentation and with a little work got it going. It's a little temperamental but works most of the time. The problem is some tired magnetic slide switches and some old TTL/RTL logic chips that were hard to find to put all the switch ranges in service.

On the new side, there are many counters being offered by several companies. Startek, Optoelectronics, and DigiMax are a few. I have several different units made by DSI—the old name that became DigiMax. As this is a San Diego-based company, it was easy for me to pick up their units locally. Which units do I recommend? Well, I have several, but I like the new units for portability, and the military commercial units for their accuracy on the bench. All units pictured are from my workbench.

Next month I will go into some features each have. There are some very unusual ones that are unique to each frequency counter. Please don't hesitate to drop me an E-mail note. It is so much easier to answer questions or just chat about something and it's very inexpensive. 73 and Happy New Year. Chuck WB6IGP. 73

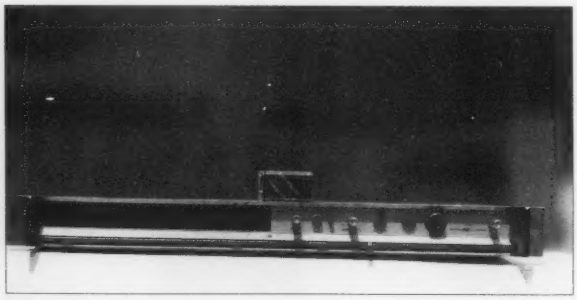


***Photo C.** Surplus Systron Downer 6036 counter good to 12.4 GHz. Note size of unit compared to 9-volt transistor battery on top of counter. Time base accurate to slightly better than .1 ppm.*

HOMING IN

Radio Direction Finding

Joe Moell P.E. KØOV
P. O. Box 2508
Fullerton CA 92837
[Homingin@aol.com]
[http://members.aol.com/homingin/]

FARS, friendship, and foxhunting

There's lots more to amateur radio than QSOing, keyboarding, and building. To many hams, it is a fine way to make lasting friends and promote world harmony. None do it better than members of the Friendship Amateur Radio Society (FARS).

FARS was founded as a Sister Cities project between Portland, Oregon, and Khabarovsk, Russia. Not content just to talk on ham radio, exchange E-mail and make occasional personal visits, these hospitable hams started a biennial tradition—the Friendship Radiosport Games. For a week-long period, FARS members come together in a host country for sightseeing, camaraderie, and friendly competition in traditional amateur radio skills. There are QSO contests, CW sprints, and a trip to a big woodsy park for radio direction finding (also called radio-orienteering, fox-teering, foxhunting and ARDF).

Since the first FRG in 1989, held in Khabarovsk, FARS has grown to include chapters in two more Sister Cities: Niigata, Japan, and Victoria, Canada. Other competitors, including transmitter hunters from California and Washington state, have joined the fun. Rivalry for the coveted FARS Traveling Trophy remains fierce, yet friendly.

"Homing In" has chronicled the growth of the Friendship Games. See the September 1991, November 1991, October 1993 and December 1996 issues of *73 Amateur Radio Today* for photos and stories of previous competitions.

Japanese red-carpet welcome

FRG-97 was in mid-August at Kanagawa Prefecture, near Tokyo, hosted by the Kamifusen Ham Radio Club. ARDF is this club's primary activity, so the two-meter foxhunt on Sunday was both the climax and the highlight of the Games.

Japanese radio-orienteers are outstanding; they compete regularly in IARU international championships. Members of the host club include some of the top Japanese ARDF stars, including OMs Noriyuki Ariyoshi JM1CVC, Nobuyishi Akutsu JM1VUH, and Koichi Andow JA1SBH. There are outstanding YLs, too, such as Jyunko Ariyoshi JM1JKR and Yoshiko Yamagami JQ1LCW. Yoshiko, a participant in all five FRGs to date, shared hosting responsibilities with Osamu Toyofuku JA5RMR.

The Russians have been proficient foxhunters for many years. The relatively new Canadian team had been practicing hard for the two years since their first trials at FRG-95 (**Photo A**). Into this fray came a much less experienced USA team. Two of its most promising members were first-timers at the Games. One was Dale Hunt WB6BYU of Yamhill, Oregon, a town of 700 souls about 28 miles southwest of Portland (**Photo B**).

"I started transmitter hunting in Sacramento around 1970," says Dale. "It was on 75 meters with the Radio Amateur Mobile Society on their periodic 'rabbit hunts.' I built a loop antenna and used a Heathkit HW-12 in the car. You didn't have to get out on foot. I always managed to ding up the car, including the time I came back home with the fender and bumper in the rear seat on the laps of the passengers because we had an altercation with a passing pickup.

"When I moved to the Portland area in 1992, there was some interest in transmitter hunting," WB6BYU continues. "Over the next year we got mobile hunts going. In 1993, I got an invitation to the Friendship Games in Victoria, but I had a conflict. I kept in touch with the Victoria hams on packet and a year ago on Labor Day, two of us went up there to try it out. There were two hunts that day in two parks and we fared a lot better than we thought we would. After that, I scrounged some 'bunny boxes' for practice. They weren't synchronized, but they did the job.

"My wife talked me into going to the 1997 Games in Russia. Unfortunately, on the weekend before Field Day my car got smacked by a fellow running a red light. I got four broken ribs and a broken sternum and was in the hospital for a few days. I had mowed the perimeter of our property for a practice running track, and when I was able to get up, I walked it. I knew I wasn't going to be able to run, but I figured if I could walk the course and find just two foxes and get back in time, that would be a victory for me. It was probably just two weeks before the contest that the pain finally went away."

Also new to the 1997 Games was 16-year-old Jack Loflin KC7CGK of McMinnville, Oregon (**Photo C**). Jack was a novice at foxhunting, but not at ham radio. "He showed up at our Field Day one year and worked the HF bands third party," says WB6BYU. "I told him that next year I wanted him to have his Extra because I needed some help on CW. He did it! He said the hardest test questions were the rectangular-to-polar coordinate conversions, because he hadn't had geometry yet. But he got his Extra while in the 8th grade. Now he's working five days a week repairing computers for the school district and doing marine patrols on the river for the Sheriff on weekends."

"I got started hunting in cars," Jack told me. "Our club did monthly hunts. We had a blast going out on those. I wasn't driving at the time, so I conned my Mom into taking me. I heard stories about the 1995 trip to Russia and then had the chance to go to Victoria with Dale. I decided I wanted to go to Japan, so I scraped up enough bucks to go. I ended up working two summer jobs and got my parents to foot half the bill."

Rounding out the US foxhunting team were Greg Hodsdon K7KJ and Kevin Hunt WA7VTD. Greg is a veteran of previous Friendship Games and Kevin is one of the FARS founders. He presently serves as general counsel of FARS-USA.

Camaraderie and competition

"The actual FRG-97 contests took place over two days," Kevin says. "The remainder of the week was devoted to companionship, climbing an active volcano, sightseeing on boats and cable cars, attending the JARL National Convention, playing at Tokyo Disneyland™, shopping, and planning future events."

"I had a great time," says Jack. "The friendship part of it really comes out. People were always exchanging gifts and having great conversations."

On the morning of the last full day of the Games, everyone headed for Fujinoengei Land, a rugged, mountainous, thickly-forested primitive area near Lake Sagami, in Kanagawa Prefecture, about two hours from the hotel. The park is next to the lake where Olympic rowing competitions have been held.

Official foxhunting rules of the International Amateur Radio Union (IARU) were closely followed. The five hidden fox transmitters, all on the same two-meter frequency, beaconed for 60 seconds each in numbered sequence. Competitors had to find as many as possible in two hours; exceeding this time limit meant disqualification. Identification was an easy-to-copy CW pattern. Foxes were concealed, but a nearby flag was visible from at least five meters away. A distinctive punch was attached to each fox for the competitors to mark the cards they carried.

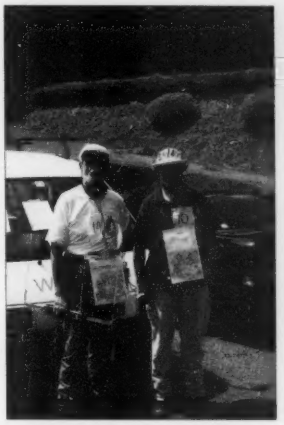


***Photo A.** John MacConnachie VE7GED (left) and Joe Young VE7FBK/7J1AZO represented Victoria, Canada, at the FRG-93 foxhunt. (Photo by WB6BYU.)*

Contestants were divided into four categories: seniors (males 18 to 40 years), juniors (boys under 18), women (any age—nobody asks!) and old-timers (males 41 and up). Seniors (also called OMs) were required to find five foxes, other categories only four. "Unlike IARU competitions, they did not specify which fox didn't need to be tracked," says Dale. Foxes could be found in any order.

"It was a good three kilometers around the course, depending on the way you decided to go," Jack

Continued on page 74

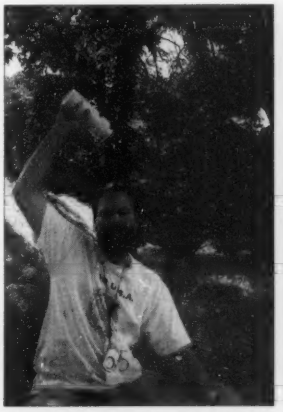


***Photo B.** Dale Hunt WB6BYU cools off and celebrates just after completing the 1997 Friendship Games foxhunt in Japan. (Photo by KC7CGK.)*

Marsha and Me

Making friends via hamming.

Arthur R. Lee WF6P
106 Western Court
Santa Cruz CA 95060

It is amazing to consider that any time you answer or send out a "CQ" you stand an excellent chance of meeting a lifetime friend. Of course, we have already self-selected those who are going to answer us. They will be fellow hams, worldwide, who have an understanding of the hobby. This includes radio theory, operating procedures, and the licensing procedure and structure. In other words, we are all thinking the same thing—the fun of communications.

Our hobby is not the same as owning and operating a cellular phone—or even a telephone for that matter. With that method of communications, there has to be someone at the other end whom you intend to contact. You would not normally drop a quarter in the slot of a pay telephone and dial a number at random. If the person answering should ask, "With whom do you wish to speak?", you would be hard pressed to keep him on the line if you replied, "Oh, just anyone!"

It's a different story with radio amateurs answering your call. Who is receiving your request to talk to someone? It could be an eight-year-old child coming on the air for the first time, or an astrophysicist with postdoctoral credentials. Medical doctors, lawyers, sailors and soldiers, bankers, farmers, housewives, and others from all walks of life belong to our hobby. A king? It could happen. A group of middle school students talked to King Hussein JY1 once from their club station in Santa Cruz (California). My brother-in-law KB6TZA would like very much to talk to his guitar-playing idol, Chet Atkins—also a ham.

In all my nearly two decades of hamming, I have met hundreds of interesting people, many of whom have become lifetime friends. I know of hams who have been in contact with DX stations around the world and, when in those countries, visited these operators for days or weeks at a time.

Photo A. *The family that hams together has fun together! Shown in their ham shack, the Messers: Brad KC7KTL, Marsha AB7RJ, and Jim KK7AL.*

One long-time ham visited Europe a few years back and was invited to the homes of his friends in over a dozen different countries. They, in turn, have been invited to his home on a reciprocal basis. I once made contact with a ham on Macquarie Island, in the Pacific Ocean. He paid me a visit when he came through California.

We hams are friendly people. If we weren't, why would we want to talk to strangers and they to us? The amateur radio hobby is one where unfriendly people tend not to congregate. The very essence of the CQ we send out is, "Is there anyone out there who wants to talk (to me)?" Yes, we are here, there, and everywhere.

I have been in contact with hams in Africa, Russia, Romania, England, Antarctica, New Zealand, Australia, and on the high seas. All have one thing in common—the need and desire to talk to others. We love to share ideas or experiences with each other. Over the years, many lives have been saved by helpful hams in emergencies. I would liken our hobby to a fraternal organization which all are free to join. When I teach ham radio classes, I tell all my students that if they are out on the road and in need, if they see a ham antenna, go there for help.

Recently, after being off the air for a few months, I decided it was time to get in some long overdue CW practice. I listened around the 40-meter band awhile, heard nothing, and so started pounding a little brass. "CQ, CQ, CQ," I sent. "This is WF6P." After a few tries I was just about to change frequencies when an answer came back, loud and crystal clear, answering my call.

I sent out the customary information of signal strength, home town, and name. It turned out that it was a young lady (YL) in the state of Washington. Her name was Marsha. We carried on our chat at about 10 words per minute and I was struck by her CW accuracy. She must have had a good teacher, because her error rate was practically zero. Her code was not only easy to copy, but she answered all my questions with a fine touch of humor. Did I hear right? Some of the expressions she used seemed vaguely familiar. Was she married to a serviceman? I had served in the Navy many years ago and recognized the nearly forgotten terms she used. We talked for an hour, at the end of which I asked if she would be on the air again tomorrow. After some hesitation, she said, yes, she would.

The following day I gave her a call. Many times, schedules are made but not kept for one reason or another. When I sent a "K", I was ready to move on if she wasn't there. "WF6P, WF6P, de AB7RJ" came back, crystal clear! OK, I thought, let me now get some more information from this interesting person.

No, her husband, also a ham, was not in the Armed Forces, but she was. She had served as a Navy WAVE. She wanted to become a radioman back then but was put into another rating. We talked about the Navy of the '50s (mine) and '60s (hers). She had served as an Admiral's yeoman at the Pentagon. I had been an aviation mechanic serving with the Pacific Fleet. She was not short on conversation so we continued on, firing questions and answers back and forth.

Her husband, their son, and her husband's father were all hams. They were studying together to increase their proficiencies in ham radio. All were working hard to improve their code speeds to attain higher license classes. Another hour of CW passed. Would she like to meet again the next day to continue our CW practice? Yes, that would be fine. Our chats took place at 0830, just right to enjoy those morning cups of coffee.

What did we talk about? Nothing much. How's your weather? What are you going to do today? This weekend? River rafting? Wow! Tell me about that, what's it like? Isn't it dangerous?

We met daily, at the same time and frequency. Our conversations expanded into details of family life—who, what, why, and where. Sisters and brothers, schooling, hobbies, and goals. All were grist for our CW mill. Occupation? Marsha, besides being a wife and mother, worked four different part-time jobs. She served in a restaurant, ran a machine that packaged Christmas trees, baked and sold baked goods, and made and sold decorative sports shirts. Now there was an energetic person!

It has been over a year and a half since we began our daily CW practice. We skip weekends. Our agreement is that if either operator is unable to make the schedule, that is all right. We have rarely not made contact and usually let the other know, beforehand, of planned absences. All in her family have advanced their license grades. She and her father-in-law hold Extra class licenses.

Last August, with airline fares being low, Marsha and her sister came to visit me and my family—also all hams. En route to visit hams in Reno, the two women met us at the airport in San Jose. We spent three days and three nights together at my home. They were able to meet my family and other hams in our area. It was fun to entertain our out-of-town, newly met, but old, friends. We shared stories of ham radio adventures. We went to the beach and toured our town. Marsha brought along her Navy and family photo album. My son and his wife brought his accordion down from Sacramento for Marsha to play. Gathering around the piano and singing popular songs was enjoyable. Marsha met my unforgettable piano teacher and we entertained in her studio.

Marsha and her sister have returned to their families and my visiting children to theirs. We miss them all, but are no further apart than our rigs. 73

Publish or Perish

There's something in this reprinted article for every *club.*

Marc Stern N1BLH
c/o *73 Magazine*

One of the most important offices in any club is that of newsletter or bulletin editor. That task provides the glue that binds a club together during the month. Like completing a circuit, a club's monthly newsletter provides a path through which the news and notices flow.

Newsletters typically range from professionally typeset, printed, and bound publications [or the now more familiar desktop-published efforts—ed.] to one-page sheets that are hastily run off at the corner copy shop. Unfortunately, there are far too many of the latter across the spectrum of radio clubs and far too few of the former.

Usually, the more professionally done newsletters are found in clubs that not only have an active membership, but are also exciting. These clubs have a dynamism and energy that spreads from the youngest member to the oldest operator. Quite likely, they also have active class programs that encourage new operators to enter the hobby, as well as active social, educational, and operating calendars to keep everyone interested.

This isn't to say those clubs with one- or two-page newsletters may not be equally active and exciting. What they probably lack is the funding to handle the printing, which can easily run over $1,000 per year for a 100-member club with 11 or 12 newsletters.

Still, it's unlikely that clubs that hastily print one-page, poorly-typeset and -reproduced newsletters are very active. Quite likely, the president not only heads the club but also writes the newsletter; takes the minutes; handles correspondence; finds speakers, films, or activities—as well as typing up the mailing labels and licking the stamps. It's a one-man show that has fallen on his shoulders by default. All it takes is one volunteer, the editor, to begin changing this picture, and the newsletter is off the ground.

However, while volunteers can make a great deal of difference, another key ingredient to a successful newsletter is the willingness to fund the cost of production. Unless someone in your club owns a print shop or knows someone who does—an ideal situation—the chances are good that you'll find you have a monthly cash outlay, which a club can't be afraid to make. Since the newsletter is the most visible part of the club to many hams and community leaders—if they are included on the mailing list, which they should be because it's just good public relations—and since it is also the primary news medium for members and potential members of the club, it pays to do the best job your club can afford.

If, for example, you can afford professional printing but not photo work, then don't use photos. Retain the professional printing, however; it lends a finished look to the publication.

The most important ingredient after the editor and funding is support. Since the newsletter is the club's mouthpiece—not the editor's private soapbox or the executive board's private opinion sheet—the editor must encourage club input. In many cases this is like pulling teeth from the proverbial chicken, but it still has to be done.

For example, in the club where I am newsletter editor—the Framingham (Massachusetts) Amateur Radio Association—I have encouraged members to submit whatever they want to submit, and I've had a fair degree of success. Recently, a couple of our women members asked if they could have some recipes published and I said, "Why not?" Yes, it did raise hackles, but it shows the type of latitude we try to allow in the newsletter.

And other times, I've had people come forward with long lists of DX operations and beacons and we've published those, too. In fact, there have been some months when I've had so much material, I've had to hold some until the next month.

I just wish that were the case all the time, but like most editors I've found that it isn't. Much of the time, I'll write just about everything in the newsletter except the minutes of last month's meeting, repeater notes, and a listing of local flea markets, exams, and special events. These are provided for me.

And this brings us to another consideration: format. Before the final printing, it's a good idea to experiment with format on a dummy issue. If many of your club members are older operators, then it makes sense to use larger type so that it's easier for them to read. Likewise, it also makes sense to print text in full-page format rather than in columns, which can be somewhat harder for older operators to read.

On the other hand, if most of your members are on the younger side, then experiment. Try various type sizes and styles to give your newsletter a unique flavor.

For example, the newsletter of the Nashua (New Hampshire) Area Radio Club, which I see as part of our newsletter exchange, has a professional appearance. Not only is it printed in two-column format, but the type style is clean and readable. Also, the club includes photos, which give its newsletter a professional feel. Besides, it's apparent from the photos that the membership is active and supports not only its club, but also its newsletter.

Another unique newsletter I have seen is that of the Wellesley (Massachusetts) Amateur Radio Society. WARS makes effective use of two-column format and graphic and shaded headlines to create a very pleasant newsletter. The writing is light and the typesetting good, setting this newsletter apart.

Looking at the other side of the coin, I have seen newsletters that are basically mimeographed or photocopied one-page throwaways that do little more than announce the meeting and the meeting site. They aren't too informative and look so amateurish that you have to wonder about the quality of the club. The print quality is also usually poor because a wide-matrix dot-matrix computer printer has been used, making everything look shoddily prepared.

With the editor found, funding and support ensured, and format determined, there's little more for the editor to do except put the newsletter together, right? The answer to that, unfortunately, is, "Wrong!" Wrong because there's still more to do, as WA1UEH, our newsletter's former editor for seven years, can attest.

Even though we have seen it is possible to establish a moderately continuous flow of material, it requires an editor's vigilance to ensure that this material will keep on flowing. For the most part, a simple phone call gets it in on time.

"The bottom line is knowing a job is done correctly and to the best of your ability."

This information-gathering process has been greatly enhanced by the arrival of the personal computer in the ham shack. Although I use mine for business purposes, I also use it in the hobby, as well as for correspondence. The same is true of other club members, several of whom also contribute material to the newsletter. We can do this because our machines are equipped with modems, which makes it easy for them to zip information to me. All they have to do is dial my home phone; the computer answers, and the information is transferred.

In this manner, we can update the newsletter until the last minute before it is transferred to the club president's machine. He prints it out and has it printed for us. As you can see, there's very little paper that changes hands today, other than in the initial information-input process.

Even with this automation, there are months in which all the persuasion and reminding in the world doesn't produce much copy. In those months you must turn to your alternate sources of

information—other club bulletins, ham radio newsletters, and organizations such as the Amateur Radio News Service.

From other club bulletins, you can usually extract local information about which club is doing what and where local classes and flea markets are being planned or held. Generally, you'll find that between your own input and local bulletins, you may be able to fill half the newsletter.

Your next source of information, then, comes from newsletters such as the *W5YI Report* and *ARRL Letter*. They provide up-to-date information on matters of crucial interest. In fact, many of the newsletters I see make liberal use of the information contained in these and other professionally produced newsletters. The only proviso in using this information is that you must credit the newsletter that originally contained it.

Likewise, the Amateur Radio News Service is an important source of input from across the country. Made up by several hundred bulletin editors, the *ARNS Bulletin* provides you with lighthearted material and cartoon fillers, as well as some serious editorials. You can use this information, provided you credit ARNS. ARNS is a separate group whose dues are $15 a year [in 1997—ed.], but it's money well spent, I have found.

Finally, if you can do it—and if your budget allows it—try to use as many photos as you can. Not only does this create interest in the newsletter, but it also creates excitement in the club, which, after all, is the bottom line of any newsletter effort.

With all of this done, the mundane work is next: folding, labeling, and stamping. If you have several people on your committee, this can go quite quickly. However, most of the time you'll find that you're doing this yourself. Relax, though; it doesn't take too much time and if the labels are computer-generated, it will be little effort to label, stamp, and mail them. In fact, if no one in your club can generate computerized mailing labels, it might be a good idea for your club to invest in having several sets of labels printed. In the long run, it will save time and effort.

When all is said and done, though, the bottom line in the newsletter is satisfaction—the satisfaction that comes with knowing a job is done correctly and to the best of your ability. Don't think that as editor you'll find people rushing up to you month after month to pat you on the back for the fine job you're doing—because they won't. To the long-suffering editor, those comments seem few and far between. But don't think the club doesn't appreciate the job you are doing, either—because it does. It's just that when a newsletter is running well and arrives on time every month, people take it for granted.

In a way, though, having people take the newsletter and its quality for granted is the ultimate compliment. It means they're satisfied with the work you are doing and with the newsletter as a whole. In fact, this type of quiet is reassuring because, as editor, you soon realize that if you blow something, you'll hear about it loud and long. Now, isn't the quiet better? You bet it is, and it means your newsletter's a hit.

So, if you have the right formula, you've got it made. Your newsletter may never win national awards, but it serves its purpose and informs. What more can you ask?

Adapted from an article in 73 Amateur Radio, *July 1986.* 73

MORE NEWSLETTER TIPS

Fill 'er up

OK, so you've decided to really improve the old newsletter, and now comes the question of exactly what it is you're going to fill those brilliantly designed, professionally produced pages *with*. Somewhere in this world, there must be someone who enjoys reading the minutes of last month's meeting. We at *73* have never met that person.

People

As much as we like to talk about rigs, antennas, and the weather, the most interesting subject in ham radio is *people*. "Fred made a new antenna out of his old Nash Rambler. Bob tried to put up a dipole with a bow and arrow, hit a sea gull, and hasn't seen the antenna since. Crazy Larry fell off his tower again—he's got an HT in the hospital with him and he'd love to hear from you." The one thing people never get tired of reading about is themselves.

Activities

Your newsletter is your chance to light a fire under your club. An "active" club isn't one that just has regular meetings. Activate your club by selling the members on a pilgrimage to Dayton, or a barbecue in your backyard, or something. A newsletter that deals strictly in reporting what has happened in the past will be *boring*. Inject the future into your publication. "Field Day is going to be bigger than ever this year—that is, if you folks will just get going. We've had 27 people volunteer to help dispense the beer, but we could really use some help getting a Novice station set up." Production schedules and delays do have a way of turning your "future" writings into history by the time the newsletter comes out, but at least you'll be closer than you were before.

Plagiarism

We at *73* do not care which of the other ham magazines you plagiarize. But seriously, folks, if you see something in *73* that would be of use in your newsletter, write us a letter and tell us what you want to do. Chances are, unless you're trying to make a buck off the deal, we'll give you the OK.

Art

Someone in your club has enough artistic skill to draw up a clever logo. Find him or her. It's true that you can't tell a book by its cover, but it's also true that your great information will be ignored if it looks ugly. Illustrations and cartoons break up the text and make for easier reading. Somebody in your club must think that he's funny enough to do a monthly cartoon. Give him a chance.

First class

It takes only slightly more effort to put out a first-class publication than it does to put out a boring rag. The editor who has had the job dumped on him and who is given no help in the endeavor is unlikely to make the extra effort—he's also unlikely to be editor for very long. With a little help from *you*, your club's newsletter will be something people look forward to receiving each month. Without your help: "The June meeting was opened and the minutes of the May meeting were approved. Don Dirge brought up the subject of whether or not to move the club repeater, which is currently not working anyway because Bill Bore forgot to ..."

No—Honestly! I'm Not a Pirate!

A tale of travail from a British Novice.

Doreen Stone 2E1DPG
12 Robertson Avenue
Leasingham, Sleaford
Lincolnshire, England NG34 8NJ

It has taken 34 years of marriage for me to become interested in ham radio. My husband and I retired several years ago, and my involvement in amateur radio began in 1995. When I got my license in January 1995, I said to my husband, "I have no rig!"

While he was arranging to set me up with my own equipment, he told me that, according to the licensing regulations, I could use *his* callsign and equipment (under supervision) as a second operator; so he set me up on 20 meters SSB with his callsign. It took him a while to find the microphone that came with the rig (several years ago), as he'd never had a use for it—but it turned up, he blew the dust off it, plugged it in, and I was in business. I worked DX over the next few days and became a confirmed DXer, but I still yearned for my own callsign.

Our national radio society usually suggests that novice operators go on 70 cm and "start talking!" My husband set me up with an FT-790 and a collinear antenna; I duly worked all the locals in my first month of operating. One day, my husband checked my log and discovered that I hadn't been on the air for some two months. Puzzled, he asked what the problem was. I told him that I had been working the same stations all the time—no variety! He offered to set me up on 50 MHz, with the warning: "Be prepared for seasonal activity—but DX can be worked."

I helped my husband put the 50 MHz station together, an FT-690R2 with 2.5 W output. To minimize losses with QRPp, we used a spare piece of Andrews-Heliax, and a relay-controlled switchbox on the mast to switch to either the three-element "Plumber's Delight" beam with its gamma match, or to the end-fed half-wave with its omnidirectional gain. My OM chose the FT-690R2 as, under no conditions, could it exceed the power limitations of three watts output. The switchbox was rated to 1.5 GHz, also to make sure no power was wasted. Minimum VSWR was pruned for each of the two antennas, looking for minimum losses. The station was as I wanted it—I was in business—but then my troubles *really* started.

A word about prefixes

2E1 is the Novice VHF/UHF prefix. Stations operate on 50 MHz and above (less 2 m), with a maximum of five watts input and no more than three watts output allowed, by license conditions. This is QRPp indeed! It's a real challenge—and as the prefix starts with a "2," followed by a letter (indicating the country), and followed by *another* number, it seems to create a mental block in some receiving stations, as the operator's mind tries to make it something more acceptable. I have been called PE1, TE1, GE1 ... anything except 2E1. I have also been ignored, something difficult for an XYL to accept—my husband proved that I was being ignored by calling the station with his Class "A" callsign and getting an immediate response of 5/9—5/9! I'm lucky that I have a husband who can pick up the microphone and explain about the Novice prefix over here—and inform other stations that I'm *not* a pirate (I've been called that by stations in three countries). I usually refer questioners to the *Radio Amateur International Callbook*. There are enough 2E1 and 2EØ stations listed there to make it obvious that my callsign is legal, but I still run into stations who don't recognize the prefix. I have even had some stations say, "2E1, you are a new country for me?

Where is 2E1?" Some are quite disenchanted to learn that the country is England!

So far, in two years of operating on 50 MHz, I have worked 44 countries in 187 "squares," in 831 SSB QSOs. I have 41 countries confirmed, with 91 "squares," including 9H1, EH6, EH8, EH9, OHØ, OJØ, T7, T9, OY and TF. For the TF, I waited for over an hour. My OM counseled patience—nothing is impossible on six. I finally got the contact and received 5/9 from the IP13 square. Then came the day my husband said, "The band is full of US stations. Get on and work them." I replied that I couldn't work the US on 2.5 W, and went to watch TV. He asked if he could have a go; he went down to the CW end as he normally would, and worked a W3, getting a 339 report. He looked at the front of the rig and saw the word "LOW" underlined—the contact had been made at less than *one* watt. I also learned, to my chagrin, that three of my Novice friends had got across to the US on SSB on six—I should have tried; perhaps next year!

There came a day when I heard "LZ" on six. I kept trying for a contact, and finally realized that I was being ignored. I yelled for my OM; he came running and explained the Novice system, but the LZ could not get the damned prefix. My husband tried to pass my prefix phonetically ... nothing doing. My OM is resourceful, to say the least—he spoke Morse down the microphone, and the LZ got it! A prize QSO for me!

We share the shack; I have it during the day and evening, he goes on after midnight and goes LF DXing on 160, 80, and 40 meters. The wall on his side of the shack is full of amateur radio awards—I guess this is what stimulated me to try to do the same. I have the Radio Society of Great Britain's awards for 50 MHz:

50 MHz Countries Award, 50 MHz DX Certificate—First Novice, 50 MHz Squares Award—First Novice, YO-45-P, and YO-25M.

I am one QSL short of the "Dip Med" Award, and one QSL short of another award—all worked, just hopefully waiting for the QSLs to arrive. The *73 Magazine* "Worked the World" Europe Award was going to be my next award, but unfortunately, it's been discontinued.

My license is Class "B". The Class "A" Novice (prefix 2EØ) has limited HF bands, with the same power limitations—so when you work your first UK Novice on HF or VHF bands, don't yell "Pirate!" Work him (or her) and give that station a little encouragement. I aspire to a higher category of license, but we live in a rural farming community, and license-upgrading courses are few and far between. Perhaps one day ... 73

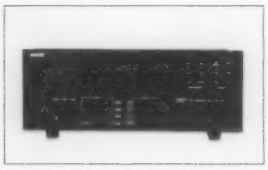
Number 72 on your Feedback card

New Products

Forced to Go to Your Nephew's Ballet Recital?

Tell 'em to stick it in their ear—or, better yet, stick it in your own! The new MFJ-292 Featherweight Earphone/Microphone is so lightweight and unobtrusive you can take it anywhere. A tiny microphone with a push-to-talk switch is built right into the cord. The high-quality dynamic earphone and electret microphone give your handheld crystal-clear audio. If you whisper closely, you can carry on a discreet QSO that won't bother anyone. How many occasions have you sat through, miserably thinking about the contacts you *could* have been making?

The MFJ-292 comes in three models (I, K, Y) to handle everything from Alinco to Yaesu, and of course it carries MFJ's famous "No Matter What" warranty, and it's only $19.95! For your nearest dealer or to order, call (800) 647-1800; FAX (601) 323-6551; or write to MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville MS 39759. Visit the Web site at [http://www.mfjenterprises.com].



Attention, Shortwave Enthusiasts

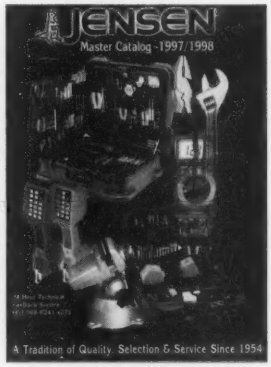
The R. L. Drake Company has announced the latest in world-band communications technology—the R8B. It's ergonomically designed for easy operation, even for beginners, but it's loaded with features to please the serious hobbyist and expert. The R8B utilizes selectable sideband synchronous detection to ensure signals are received loud and clear. In the AM mode, the selectable sideband synchronous detector provides enhanced reception by eliminating or reducing distortion caused by fading signals. The 100 kHz to 30,000 kHz frequency range allows coverage of all world bands. Additional VHF bands (35–55 MHz and 108–174 MHz), including marine and aircraft bands, are also available with and optional VHF converter.

The R8B's five built-in filter bandwidths ensure reception of most signals under virtually any conditions. A built-in noise blanker minimizes electrical interference; passband offset control minimizes or eliminates adjacent signal interference without compromising maximum intelligibility. A built-in preamp and attentuator also improve reception of extremely weak signals, as well as very strong signals. Yet another built-in feature is the multi-voltage power supply, allowing operation virtually anywhere in the world, and then there's ... well, find out for yourself! Contact the R. L. Drake Company, 230 Industrial Drive, Franklin OH 45005. Call (513) 746-4556; FAX (513) 743-4510; or hit the Web at [http://www.rldrake.com].

TTE's New Five-Pole Filter

TTE, Incorporated, makers of filters for more than 40 years, introduces their Model 305-1270M-60M. It's an industrial quality five-pole 1296 MHz bandpass filter made with the same materials and processes used in the filters TTE manufactures for the aerospace industry. Each filter has its own serial number, and each shipment is packed with final test data to show that each filter meets all specifications.

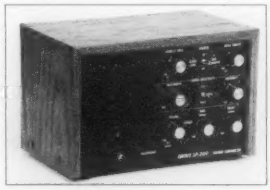
Product literature is available; ask for the Ham Radio Department when you call (800) 776-7614 or (310) 478-8224 for information or to order. You can FAX TTE, Incorporated, at (800) 473-2791 or (310) 445-2791; write them at 11652 Olympic Blvd., Los Angeles CA 90064, or [swlsw@tte.com]; check out the Web site at [http://www.tte.com].



Toy Time

Jensen Tools, a subsidiary of The Stanley Works, has been the premier designer and developer of tool kits for the installation, maintenance and repair of electronics equipment since 1954. Their latest catalog features 300 pages of essential items, including a number of test instruments, specialty tools, testers, probes and other devices new to the marketplace. Standard product lines have also been expanded and strengthened to offer customers the widest range of items available.

For your free copy of the catalog, call (800) 426-1194 or (602) 968-6241; FAX (800) 366-9662 or (602) 438-1890; E-mail [jensen@stanleyworks.com]; or write to Jensen Tools, 7815 S. 46th Street, Phoenix AZ 85004.



What's That Y'Say?

Modern communications equipment and accessories are noted for their poor audio, making listening difficult and fatiguing. Whether your listening interests include scanning, shortwave, ham radio, or even if you need to clean up the audio on another sound system, the Grove SP-200B Sound Enhancer improves sound dramatically, often bringing barely receivable signals out of the background. For privacy, the speaker may be switched off while audio is being monitored via a front-panel headphone jack, or redistributed from a rear-panel jack.

The SP-200B is powered by 12 VDC, and may be operated mobile or from an optional 12 VDC supply. For more information, or to order at its new low price of $199.95 plus shipping, contact Grove Enterprises, Inc., 7540 Highway 64 West, P.O. Box 98, Brasstown NC 28902. Call (800) 438-8155 (US & Canada) or (704) 837-9200; FAX (704) 837-2216; or E-mail them at [order@grove.net].

Advertisers' Index

When you buy products from these advertisers, please tell them that you saw their ads in 73.

Subscribe to 73 right now...call 800-274-7373 (9-5 Monday-Friday EST).

***Photo C.** Jack Loflin KC7CGK on the FRG-97 foxhunt course. (Photo by WB6BYU.)*

Homing In

Continued from page 63

reports. "The hunt area was two and a half by two kilometers." Scoring was first by number of foxes found and second by elapsed time. Conferring with teammates regarding fox locations was strictly prohibited.

"To win this hunt, one needed not only RDF skills, but strategy, endurance and running speed," says WA7VTD. "Nineteen radio-athletes started in three groups, five minutes apart, with no bearings allowed until a line 100 meters uphill on the mountain trail had been crossed. The temperature hovered at 95° F, with nearly equivalent humidity. Returning to the finish area in time required at least a one-and-a-half-mile mountain trail run, toting RDF gear. Each contestant was given a topographic map of the area. Compasses, but not GPS units, were allowed."

"We started and ended in the park," says WB6BYU. "But most of the transmitters were hidden close to a paved road that curved up by some schools, houses and so forth. One was beside the trail where it came to the road, another next to a soccer field. A third was off the end of a dead-end paved road, up the grass trail. If you got down among the construction equipment there, you could get confused. But if you stayed on the trail, it was right there.

"Everyone used amplitude-based RDF gear," Dale continues. "There were no dual-whip switched-antenna sets. The transmitter carrier was not keyed. The receiver I used has a audio S-meter mode, but I couldn't readily tell which beacon I was DFing in that mode because I got a continuous tone. So I had to keep switching modes. Transmissions were definitely horizontally polarized. Their Mizuho foxes have a turnstile-type antenna.

"I used a home-built three-element yagi. I had plans to make one out of a tape measure, but I ended up making it with welding rod. It has a PVC pipe boom; the elements fit into the pipe for storage. My receiver was taped to the handle below where I hold it. That gave good balance, and a lot less stress on the wrist.

"I have a real good sighting compass, but when plotting on the map, I just eyeballed it. I probably could have had a whole lot more accuracy in my bearings. I never found a transmitter when it was on, it was always just after it went off."

"The terrain was really hilly," says Jack. "There was a good 500 meters of elevation change, so it was a lot different from the area where I was used to hunting. You could either run over the hill to where the transmitters were or run further around the side. I run around home, but I usually don't run up and down hills. On this hunt, I went over the hill at the start. Later I started to search for the beacon transmitter at the finish line with about 15 minutes left, and ended up going back over the hill instead of taking the path that followed the base of the hill. Afterwards, I had to take it easy for about an hour, because I was kind of nauseated.

"I'm pretty familiar with signals bouncing off canyons because we encounter that in the cars," KC7CGK continues. "However, I had never hunted in mountainous terrain with a Russian Altai RDF set. The only experience I had with the Altai was on flat ground. The signals going up the canyons catch you off guard. I had gotten used to just pointing it in one direction and running off."

WA6VTD reports: "By consensus of the multinational judging committee, it was clear that Team Japan won the foxhunt, with the Russians close behind. USA placed third. The old-timers proved by far to be the most competitive. This was the category containing the bulk of the Japanese super-athletes. In fact, the first eight old-timer finishers did better than all contestants in all other categories.

"Despite the intensity of the competition, these were still the Friendship Games," Kevin adds. "So it was not surprising to see WB6BYU offering water to a tired Japanese opponent on the trail or K7KJ buying UAØCDX a soda from a machine located on a road two miles from the start, between two fox sites. In Japan, cold beverage machines are literally everywhere."

"Nobody found all five transmitters," reports WB6BYU. "In the old-timer category, the only person finding the required four did it in about three minutes below the time limit. I was sixth in that category. Coming off the broken ribs, I was just thrilled to finish."

Bigger and better

One sure sign of a successful event is a drive to hold another and to make it bigger. FARS leaders are already investigating possibilities for a new FARS chapter (an Australian group is interested) and they're laying the groundwork for FRG-99, to be held in Portland.

Besides the Tenth Anniversary Jubilee, FRG-99 may become an IARU-sanctioned Region 2 (North and South America) championship. A new ARDF Organizing Task Force has just been formed to work with IARU leadership to set up the necessary committees and protocols to sanction ARDF contests in this part of the world. If this is to happen, preliminary and qualifying events will be needed throughout the western hemisphere to identify future champion radio-athletes.

You can get involved by helping your local radio club sponsor practice and preliminary ARDF events. To find out how to do it, point your Web browser to the "Homing In" site or send E-mail to me. If you're not on the Internet, use the Postal Service. Addresses are at the beginning of this article. 73

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
P. O. Box 473
Stevenson MD 21153
[ajr@ari.net]

Letter time

It's a new year, and here's a new thought about this old segment of the hobby. I received a letter from Jim W8FDV which said, in part:

"I have trouble hearing and have found out that there are other hams with hearing problems who have turned to RTTY. Tune the scope in, read the screen, make the contact."

Truly, that hearing-impaired hams can communicate on the air just as other hams, with and without other impairments, is a tribute to our hobby. I wonder how many such individuals are out there, and how they got started in ham radio. Perhaps some of them could share their stories with us, for inclusion in future "RTTY Loops". Let me hear from you.

It's always nice when I hear about someone getting started in RTTY or digital communications from material printed in this column. Such is the case with Balaji Gopalakrishnan KK7HE/W7YD, who writes:

"I just got started in RTTY after I checked out K7SZL's unofficial Hamcomm home page [www.accessone.com/~tmayhan/]. I built the receive part of a simple interface circuit I got at that site. Right now I am busy with my master's thesis in civil engineering, but once my advisor relaxes I'll start on the transmit part of the interface! I like your column. The thing I liked most was the series of articles you wrote starting August '96 about the basics of RTTY. I don't (or didn't!) know anything about how RTTY worked. One thing I don't like about the interface I built is that it is highly susceptible to noise and QRM. I can build a passive filter, but that would be too bulky and may not be good enough. Might it be possible for you to publish a circuit for an inexpensive audio filter (active)?"

Well, Balaji, I looked around a bit but could not find a simple circuit in any of my references. So, I turn it over to the readership for the latest and greatest out there. Let's see those circuits, folks, and I'll pass along good ones here in the magazine.

After the blurb about the RTTY pix, I enjoyed the comment from another pioneer, Wayne K9SLQ, who reiterated: "Well, Marc, I am sure you would expect a comment from K9SLQ ... The RTTY pix were my favorites. I remember Don WA6PIR well and truly enjoy the old pix. I sure wish I had a disk full of those babies!"

Wayne, I am looking around. The picture files that I still have are either on paper tape, which is rapidly decaying, or on old eight-inch floppy disks that I have long since lost the ability to read. If I can find a source of picture files that can be read by current computers, perhaps we can add some of them to the RTTY Loop Disk Collection. Stay tuned!

Regards as well to Tom KB9IVP, who said: "Marc, I have long since forgotten TTY pictures. I was working at a small police department years ago when they installed the 'new TTY' and we could check records. Wow. Your article reminded me of the many pictures that would be sent to our site. Ah, yes. They were real art. I run RTTY on 14.085 and have regulars I contact in EU. It's fun. Thanks for the memory."

Another RTTY newcomer is Robert Gray, who passes along: "I enjoy your site. I used to use the Universal M7000 to decode some RTTY, but it was pretty discouraging because I couldn't translate about 90% of what I could receive. I have downloaded some of the programs you mentioned and I am going to give it another try, with the help of your Web pages."

Sounds good to me, Robert. There are plenty of programs out there, and they certainly span the gamut from simple and basic to overly complex. We would all be interested in following your adventures in their application.

Speaking of programs for radio teletype, Tom N6XB asked where he could find the program WINRTTY. I searched around and found the site at: [http://people.delphi.com/w5xd/writelog.html].

After checking it out, he wrote: "I am still evaluating some products for RTTY and PACTOR. Hamcomm works surprisingly well, but has no PACTOR mode. I think a good DSP noise filter would help it a lot. Or maybe a good dumb TU with Hamcomm. I am also checking out RITTY, but have not got it running on my notebook computer yet. Next stop is to check out WINRTTY. I want to get something going before the RTTY contest."

Tom also passed along the information that BMK Multy™, mentioned here a few months ago, can be purchased from Schnedler Systems in Florida. I don't have a full address, but that should help.

Not everyone can get into RTTY so easily, though. Barry Maxfield KC7SBQ passes along the following request:

"Being new at the teletype business, and really wanting to succeed at it, I find there is lots of partial or junk information circulating on how to get started

Number 76 on your Feedback card

HAM TO HAM

Your Input Welcome Here

Dave Miller NZ9E
7462 Lawler Avenue
Niles IL 60714-3108
[dmiller14@juno.com]

This month we begin a series put together by Roger Block, president and chief engineer of PolyPhaser Corporation of Minden, Nevada, and his brother Ron Block, owner of W.R. Block and Associates (representatives for PolyPhaser) of Clarksboro, New Jersey. Roger and Ron have done a tremendous amount of research into the whys and wherefores of lightning protection for their commercial customers, but most of their research has equal relevance to our own amateur radio station antenna installations. Lightning doesn't discriminate between amateur or commercial antenna sites—we're all vulnerable! Commercial installations are often located on out-of-the-way mountaintops, so they may have more vulnerability to lightning strikes from that standpoint, but the rolling hill country and flatlands that we hams live in can be equally appealing targets for Mother Nature's fury, when a highly charged thunderhead moves across the sky over our QTH.

Admittedly, not all of the tips and suggestions made by Roger and Ron Block will be applicable to each of us, but the more understanding we have of the mechanics and safe handling of lightning events, the more these suggestions can be incorporated into our own backyard antenna installations. The material to be presented here each month in this series can become a bit involved, from both the technical and ease-of-installation standpoints. I'll do my best to break it down into manageable chunks. If you find that you don't quite understand a certain concept, it may pay to reread it a couple of times, then let it rest for a while, going back to it later for still another reread. I've found this to be a successful approach in my own case when there's a great deal of information to absorb in any complex subject. It usually works. If you'd like to see the original, unabridged version of Roger and Ron's work, contact PolyPhaser Corporation, Customer Service Department, 2225 Park Place, P.O. Box 9000, Minden NV 89423-9000 and ask for their Special Bulletin, "Protection to Keep You Communicating" (copyright 1995). You can also pay a visit to PolyPhaser's home pages on the World Wide Web at: [http://www.polyphaser.com/]. PolyPhaser's Web site also supports text downloads of the original material that's going to be condensed here plus other related texts on the subject. The PolyPhaser Tech Line telephone BBS at (702) 782-6728 is also available to interested readers. The communications parameters are: Data bits—8, Parity—None, Stop bits—1, Baud rate—300 to 14400. If you are dialing in for the first time, the Tech Line requests your name, address and telephone number. You will also need to create a password. Once you've logged on, just follow the menus to navigate around the bulletin board. Many thanks to Roger Block and Ron Block for their kind permission to disseminate the information in this series via *73*'s "Ham To Ham" column.

By the way, this series is not intended to be just one giant ad for PolyPhaser. The fact that it comes from a commercial source, in my own opinion, adds credibility to the tips found throughout the discussion. Roger and Ron have done their homework; you don't get away with selling hype and fairy tales in the commercial communications world ... at least not for very long. If the techniques that the authors will lay out for you weren't effective, word would quickly make the circuit and the business would have disappeared (it's been active since 1979). Commercial customers expect to be served with scientific facts and effective solutions. I'll keep the references to PolyPhaser itself to a minimum, but obviously the name will pop up from time to time. Again, this is not a paid or otherwise compensated advertisement. It's good, sound, proven information that hasn't been disseminated nearly enough in the popular amateur radio press ... until now.

Lightning protection—what your mother never told you!

A National Weather Service survey shows that lightning kills more people annually than

---

in teletype operations. To start, the ARRL handbook offers little information. Then there are Web pages that give tidbits of information, but nothing comprehensive.

"Another problem I seem to run into is the fact that Utah is pretty much an FM state, so the common digital operating mode is packet, which I have no interest in. Therefore there really isn't any local talent to help me get started.

"It seems that here in the west there are few HF operators who operate Baudot. I hear unrecognizable digital modes on the airwaves, but no reassuring chatter of old-time Baudot RTTY. Maybe I'm the only person left in this country who would like to try his hand at nostalgia operating—that is, Baudot and an old-time Model 15 teletype. I wish there were an answer. Then there are other nagging questions that pop into my mind, like why can't my brother, who is a ham, and I operate Baudot RTTY on two meters? This is just one of a hundred questions that go unanswered.

"This list of questions festers in my mind. There are few sources of information on the matter, and since the Elmer system in amateur radio is dying off, there are few people who really can help me find out what I need to know. Any ideas where I might turn to find out about this interesting business? Otherwise, please be gentle when you break the news that the golden days of teletype are over and there are no Baudot operators out there anymore."

First off, Barry, the golden days may be tarnished, but they are not over—not as long as there are interested folks like you around! There is no reason you cannot operate Baudot on VHF AFSK. I was doing it 20 years ago, there are folks doing it today who are not on packet, and you can do it, too. All you need to do is hook up an AFSK generator to the mike input of your transmitter, and go to town. There have been suitable circuits published in this column in past editions.

As for HF, the beauty of HF is that it does not respect state boundaries. Therefore, you are not limited to Utah! Check out 3620 kHz or 14080 kHz for a familiar beedle beedle of 60 wpm FSK. Above all, ask around—I'll bet you can find some action on the airwaves, if you keep your ears open. Give me some follow-up on your successes!

As always, I remain accessible to you all via snail-mail or E-mail.

Check out the "RTTY Loop" Web site, as well, at [http://www2.ari.net/ajr/rtty/] for back columns, RTTY links, downloads, and a full listing of the "RTTY Loop" Disk Collection. Above all, stay in touch—I love hearing from all of you! 73

hurricanes, tornadoes or floods—up to 300 people a year.

More than 100 lightning flashes occur every second in the atmosphere or 8.64 million every day. Fewer than 20% hit the Earth's surface; the rest jump from cloud to cloud.

About 18,000 homes and buildings are damaged yearly by lightning-caused fires. Many more people are killed and injured this way too, but their cases are rarely reported as lightning-related, so they are not included in the lightning statistics.

Deaths and injuries from lightning can be caused by direct strikes, side splash or the spread of ground voltage after the strike. Blood vessels in the head have the least resistance to electrical charge, and strikes frequently result in eye damage. Lightning can also cause paralysis, heart stoppage and other traumas.

The Guinness Book of World Records recorded that a former Shenandoah National Park ranger was struck by lightning seven times and survived. By the way, he lived in Dooms, Virginia.

The concept of lightning protection can be summed up in just a few words: We don't have control over Mother Nature, but we do have quite a bit of control over how a lightning strike's energy is dispersed and dissipated. That's an important point to remember. It means that we can maintain control over the destructive nature of lightning by providing a path to Earth for the strike's energy, and by not simply allowing that energy to choose a random path. Here's another key issue: Building or structural protection is more forgiving than modern-day electronics. A building can handle usually 100,000 volts, while solid-state electronics will often be damaged by just a few volts over the intended safe operating voltage.

The primary rule for protecting your ham radio equipment against damage from a lightning strike is in the interconnection of all of the station elements to a single, low-impedance ground system. Included in this low-impedance ground system are the antenna, the antenna support and all of the input/output lightning protection devices within your system. We'll expand on these points greatly throughout the remainder of the series.

There's an old joke in the real estate business that goes something like this: What are the three most important factors in placing a value on a piece of property? Answer: location, location, location! The same thought applies to an antenna tower's ability to dissipate a lightning strike ... location, location, location. The antenna's location and the effectiveness and location of its planned grounding system will determine how fast and effectively the energy in a lightning bolt will be able to be carried away from the tower structure and dispersed into the surrounding soil and, perhaps most importantly, how much of your expensive electronics will survive.

Here's a picture that you might want to keep in mind: Most lightning strikes will carry huge charges of like polarity. But being of like polarity, those charges will naturally repel each other and want to disperse. The easier the path that you give the lightning charges to disperse in safely, the more likely your equipment will survive the hit. An antenna ground system composed of a number of ground rods, interconnected below grade by large bare radials, will have a better chance of dispersing the strike's energy than a lesser system would have. So the golden rule for surviving a lightning strike is the same no matter which of the many possible variations you may have, i.e., all equipment elements must be connected to a single, low-impedance ground system. This includes the antenna, the antenna support (the pole, the tower, etc.), and all of your station's input and output lightning protectors ... transmission line protectors, power line protectors, telephone line protectors, rotor control cable protectors, etc. By the way, the term radials, as applied here, doesn't refer to the thin wire radials that might normally be used by amateur operators to provide a better "phantom" ground for an HF quarter-wave vertical antenna. When dealing with lightning, don't think small, think big. The radials we're referring to are wide, below-grade copper straps that will be used to help disperse a powerful lightning strike into the Earth's surrounding soil, though they may also contribute to a lowered feedpoint impedance for your HF quarter-wave vertical as a bonus.

Let's examine the significant elements of a good grounding and protection scheme to help you construct a "bulletproof" installation that will have a reasonable chance of surviving a direct lightning strike.

We begin by choosing the antenna's location. This, and the type of antenna, will dictate the size and layout of the earth ground system needed to reasonably disperse the strike's energy. Remember, the faster the ground system is able to spread out and absorb the strike's energy, the better the chances of preventing it from traveling to your equipment. The antenna ground system is part and parcel of the antenna's "location," in the sense that we'll be using that word.

As we'll detail later on, the primary ground system is represented by a set of copperclad ground rods, interconnected below grade, with bare copper radials.

Also fundamental to a good protection scheme is the creation of a single-point ground within the ham shack. This single-point ground will be used to mount all of the I/O protection equipment and to provide a ground for all of the equipment cabinets at the station's operating position. This interior single-point ground is connected to the external ground system (composed of those radials and ground rods) by the lowest-impedance copper strap that you can manage. The tower ground system outside and the single-point ground system inside must be solidly interconnected with a low-impedance metallic strap, so that your coax cable's shield is not the only interconnection conductor between these two ground points. Keeping as much of the lightning's energy off of the coax shield as possible is essential to minimizing damage from a direct hit. For larger strikes, it's best to incorporate a grounding kit prior to the protector, to save your expensive coax connectors from arcing damage. An effective (good quality) coaxial in-line protector can then be used to handle smaller strike currents that may be tempted to travel down the cable itself.

That's all from Roger and Ron Block for this month. Be sure to check back next month for more of their advice on keeping your ham station safe from the devastating effects of a lightning strike ... their series will continue here throughout the rest of this year.

Keep whittling away at it

From Stephen Reynolds NØPOU: "I found myself in need of a special 12-volt DC power cord recently, and not having the exact female end (to match the male connector on the equipment in question), decided to 'whittle the problem down' to match what I did have on hand.

"The connector configuration that I needed is roughly illustrated in **Fig. 1(a).** The configuration of the cord that I had on hand is shown in **Fig. 1(b).** A reasonably short amount of time with a sharp hobby knife provided me with the resultant connector end shown in **Fig. 1(c)** (the dotted outline being the material whittled away).

"With so many different plug configurations showing up on equipment these days, it can often prove useful to keep a small stock of various cords on hand, and whittle away at them when

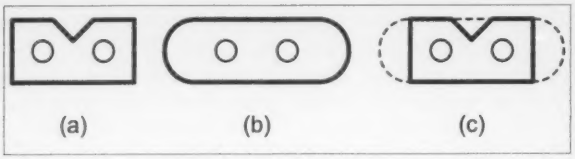


Fig. 1. (a) is the desired end connector shape; (b) is the starting connector; (c) shows how things were whittled into shape.

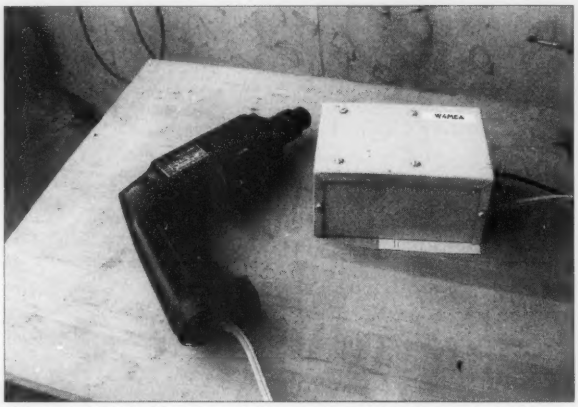


Photo A. W4MEA's "recycled" cordless drill alongside its home-brew 120 VAC to 12 VDC power supply.

something special (and unavailable) is needed in a hurry. If the cord is carrying DC voltage, double-, triple-, and even quadruple-check to make sure that you've matched the positive and negative pins on the equipment and the power cord correctly. For AC needs, polarity is generally much less critical. I hope that others will find this approach as useful as I have."

New life for an old drill

From Max Holland W4MEA: "Hate to just throw away your old cordless drill simply because the built-in NiCd batteries have seen better days? Many times it will cost nearly as much to replace the defunct NiCds as it would be to buy a completely new drill ... and you'd still have an old drill! Low-cost cordless drills often have a bad track record when it comes to battery life; the better ones have huskier batteries and generally use more than just a transformer cube and a diode in their charging circuitry. But what can you do with the old drill?

"Why not recycle it (a very '90s thing to do) for use at your workbench, powered from an inexpensive and easy-to-construct dedicated power supply? The motor in your old cordless drill is just a DC motor and it doesn't really care whether its power comes from a battery pack or from a simple AC-to-DC power supply.

"Begin by removing (and recycling at a NiCd battery collection center) the drill's defunct cells, counting the number of NiCd cells used. These drills generally use between 6 VDC and 12 VDC for full power, so 10 NiCd cells would indicate that the motor is roughly rated at the higher 12 VDC figure. NiCds will charge up to 1.4 VDC per cell, but quickly drop to 1.2 volts per cell under load. Their effective charge-life (usable time before recharging) remains fairly constant up to 1.0 VDC per cell, after which they drop toward zero pretty fast (time to stop demanding power from them). So just counting the number of cells and multiplying by 1.2 will give you a close enough voltage rating of the drill's motor (if it's not marked on the motor housing in any way).

"The schematic diagram in **Fig. 2** shows how you can use an easily obtained Radio Shack™ #273-1511, 12-volt, 3-amp transformer (see moderator's note below), along with a #276-1181, 25-amp, 50-volt bridge rectifier unit to whip up an unfiltered cordless drill power supply. You can house the parts, along with a safety fuse holder, in any metal housing that you might have on hand. **Photo A** shows how the one that I made up turned out—certainly close enough for occasional bench work! Connect the negative lead to the rectifier for a 9.6- to 12-volt drill, or connect it to the transformer for a 6- to 7.2-volt unit. If you need a two-speed option for a 9.6- to 12-volt unit, you can simply switch the negative lead between the transformer's center tap and the bridge rectifier's negative terminal for a HI/LO speed option. The switching can be done either at the power supply or in the drill itself if it happens to have a speed selector switch already built into it. A third wire back to the power supply would do the trick in the latter case. Be sure to use a cable from the drill back to power supply that will carry the motor's current safely and stand up to the flexing and kicking around that it might receive on your workbench. That's all there is to it!

"By the way, don't try to utilize any of the parts that were originally supplied with the drill for its charging circuit. They're no doubt rated only for supplying charge current to the battery pack (usually one-tenth of the pack's rated amp-hour capacity), and won't be capable of supplying nearly enough current for the application I'm describing. Stick to the parts described or equivalents from a reliable parts source."

Moderator's note: To be on the safe side, measure the actual current drawn by the DC motor in your own cordless drill before building up the supply shown in

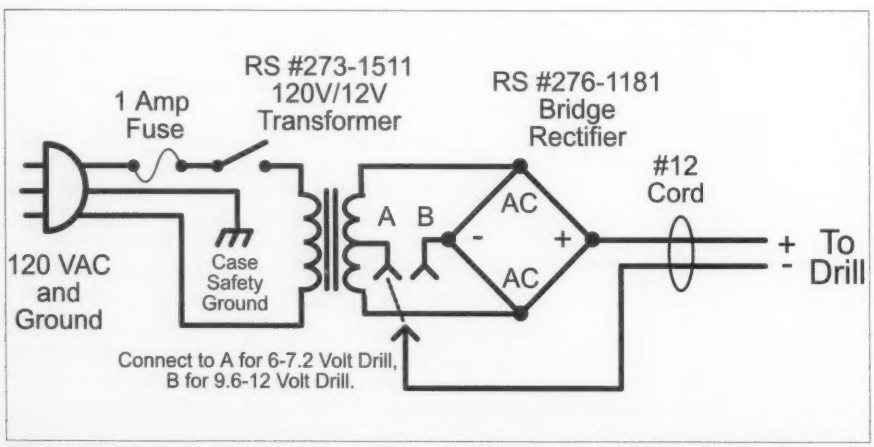


Fig. 2. The unfiltered power supply recommended by W4MEA for powering a cordless drill.

Number 79 on your Feedback card

CARR'S CORNER

Joseph J. Carr K4IPV
P.O. Box 1099
Falls Church VA 22041-0099
[carrjj@aol.com]

A bit of random science, a product and a health warning: This month we have another of my "potpourri" columns. One topic covered is "randomness" and why we often mistake randomness for order. We will also look at a new product, and provide a cautionary warning for ham radio and SWL buffs who want to keep their hearing.

What does "random" look like?

We are constantly made aware of random processes. They are all around us. Unfortunately, human beings are wired to reject randomness. Our brains, according to cognitive psychologists, are optimized for pattern recognition to such an extent that we inherently seek patterns—even when there is none. Humans are technically known as *Homo Sapiens*, but *Homo Explainicus* and *Homo Patternicus* are better suited, I think. Why? Because we constantly strive to explain everything and usually make the explanation on the basis of perceived patterns.

One of the problems is that we don't really know what "random" means. If we see what appears to be a pattern, then we focus on that pattern and refuse to see other alternatives. Consider the "coin toss" problem. A coin has two sides: heads and tails. If the coin is a so-called "fair coin," then a large number of flips will reveal that the incidence of "heads" and "tails" is about even. Most coins are "fair" enough that the near 50/50 split between "heads" and "tails" consistently turns up in our tests.

But what if we see five consecutive "heads" come up? Do we assume that the problem is a biased coin? Is the coin tosser somehow making the result come up "heads" rather than "tails"? No! Take a look at **Fig. 1.** This chart records the possible results of coin tosses. At each juncture only two results are possible: heads or tails. It's a random 50/50 binary decision. Only two possible states occur: H or T. Could there be any pattern at all in this project? Note that the trajectory through the table on the far left has five consecutive "heads." Also note that the trajectory on the far right has all "tails." Furthermore, there are several trajectories in which the H/T flip-flop patterns T-H-T-H-T or H-T-H-T-H are possible. These are distinct patterns that suggest non-randomness to the uninformed even though the process that produced them is purely random.

I can't get off this topic without mentioning something that happened to me in college. In the late 1960s I was at Old Dominion College (now University) in Norfolk VA. One comfortably warm late April day a bunch of us were sitting in the Webb Center (student union) lounge area dreading our 2 p.m. calculus class. One wiseguy suggested that we decide what to do by flipping a coin. He drew out a quarter and announced: "Heads we go to the beach, and tails we go (to drink beer) to the King's Head Inn ... and if it stands on end we go to class." He tossed the quarter about two feet in the air, but missed it when it came back down. That coin struck the floor, rolled around in a wide circle about three times and then came to rest *on its edge* against the leg of my chair. That darn "fair coin" wasn't a bit fair to a bunch of lazy EE students.

One of the reasons why people fall for "junk science" so often is that we attempt to find those patterns in purely random events, and then make sense of them. Another thing that leads us astray is that we have an inherent tendency to increase the perceived relevance of evidence that fits our preconceived notions ("sharpening") and decrease the relative importance of disconfirming or contrary evidence. When confronted by two opposing theories we will often over-scrutinize the one that we don't like, while hardly challenging the one we do prefer. That's why scientists use the scientific method to make progress. It is a public, structured way of doing things that minimizes the possibility of error by following procedures and then submitting to the criticism of peers. Junk science is neither structured nor peer reviewed ... and that's why we see so many problems.

SESCOM LAB-x boxes

A couple months ago I mentioned a new series of aluminum boxes by SESCOM, Inc. [2100 Ward Drive, Henderson NV 89015-4249; (702) 565-3400 (voice) or (702) 565-4828

***Fig. 2**. Some of these little cordless drill motors draw deceptively high currents under load, as much as 10 amps or more!*

If you intend to use the drill and bench supply with any of the more power-hungry of the cordless drill motors, the transformer specified in the drawings will probably not be sufficient to meet the necessary current demands of your motor. Higher current 12-volt transformers can be obtained from several of the suppliers who regularly advertise in 73 and would be a better investment.

Murphy's Corollary: Only once all the 18 cabinet screws have been completely replaced will you remember about the blown internal five-amp fuse!

Happy New Year to all our readers and thanks to all this month's contributors:

Roger Block, President
PolyPhaser Corporation
2225 Park Place
P.O. Box 9000
Minden NV 89423-9000

Stephen Reynolds NØPOU
510 S. 130th Street
Omaha NE 68154

Max Holland W4MEA
7333 Valley Lane
Hixson TN 37343

If you're missing any past columns, you can probably find them at *73's* "Ham To Ham" home page (with special thanks to Mark Bohnhoff WB9UOM), on the World Wide Web at: [http://www.rrsta.com/hth].

Note: The ideas and suggestions contributed to this column by its readers have not necessarily been tested by the column's moderator nor by the staff of *73 Magazine*, and thus no guarantee of operational success is implied. Always use your own best judgment before modifying any electronic item from the original equipment manufacturer's specifications. No responsibility is implied by the moderator or *73 Magazine* for any equipment damage or malfunction resulting from information supplied in this column.

Please send any ideas that you would like to see included in this column to Dave Miller NZ9E at the address at top of column. We will make every attempt to respond to all legitimate ideas in a timely manner, but please send any specific questions on any particular tip to the originator of the idea, not to this column's moderator nor to *73 Magazine*. 73

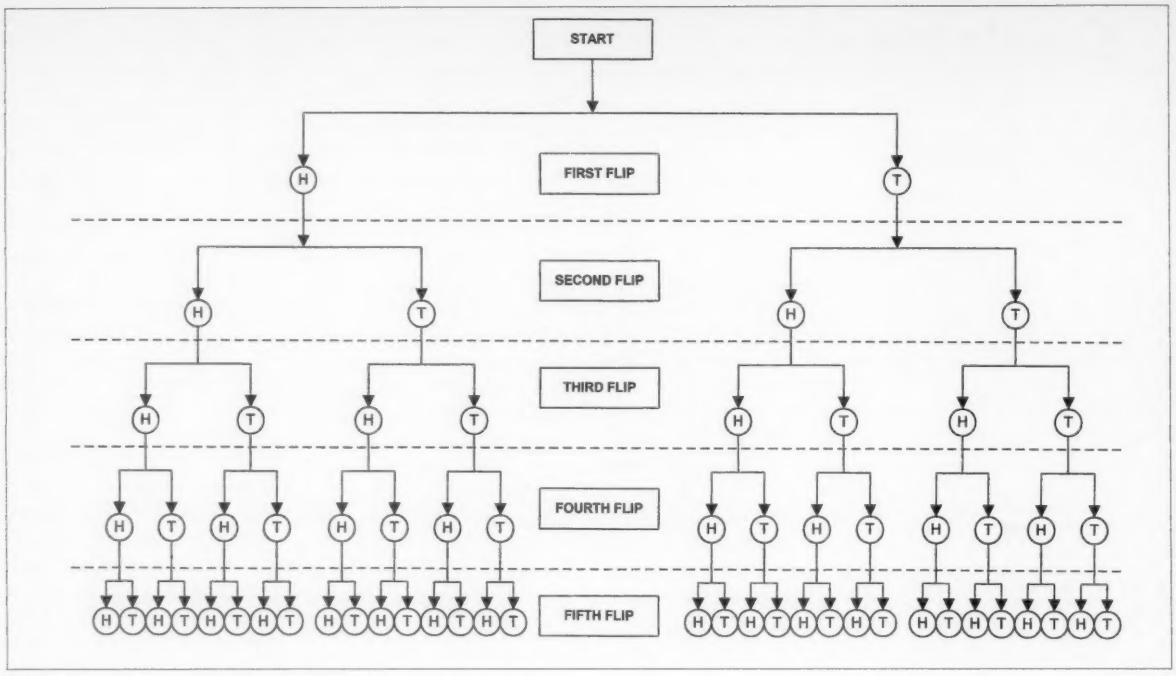


Fig. 1. *Coin toss possible results for five flips.*

(FAX)]. **Photo A** shows a selection of the boxes from a sample designer's kit provided by SESCOM. The LAB-x series of boxes joins a family of several different types of box that are very useful to the RF and audio project builder. I tested a few of the boxes and found them very easy to put together and use in practical projects.

The widely different prepunched panels are especially useful. I loathe drilling holes for BNC and SO-239 coaxial connectors, so will prefer to use a pre-punched panel. Even the 0.25-inch hole needed for small-size RCA phono jacks can be accommodated with special SESCOM end panels. If you've ever tried to cut out a DB-9 or DB-25 chassis mount connector you will leap with joy over those pre-cut end panels!

The SESCOM LAB-x series of boxes are constructed from kits using no tools other than a #1 miniature Phillips™ screwdriver (like the little blue Xcelite model).

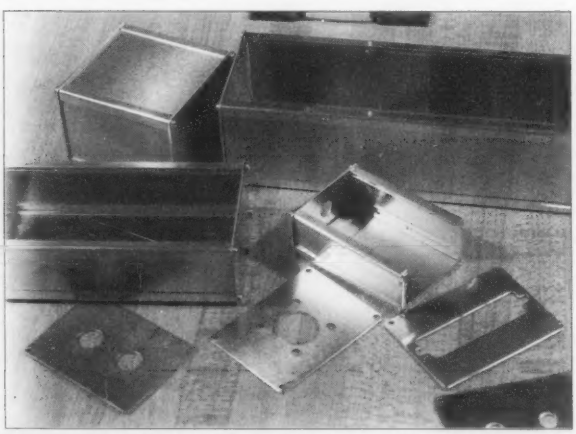


Photo A. *The SESCOM boxes for RF, audio and instrumentation builders.*

Caution: Ham radio can be hazardous to your ears!

My right ear has a constant, never-ending ringing that sounds about like a 4 kHz sine wave. Because of it, I never have a quiet day. At night it is particularly bad because there is less interfering noise from the environment, so the ringing sees a more favorable (for it!) signal-to-noise ratio. The ringing started about a year ago. It wasn't constant at first. It would come about once every day or so. But over a period of several weeks it got real damn annoying. So I went to the doctor, who referred me to an ENT ("ear, nose, and throat") doctor.

The ENT doc sent me, in turn, to an audiologist who ran a simple audiogram and found rather bad high-frequency hearing loss in that ear. This is a test where they step through a number of audio frequencies at different amplitudes and you indicate which ones you can hear. The audiologist next ran an evoked potentials test called an "ABR." This test is a variant on "evoked potentials" recordings (which I worked with in engineering grad school). In this test they pick up the patient's EEG (brain waves), while repetitively providing the same tone to each ear in turn for several minutes. When the EEG waves are signal-averaged, the component due to the sound emerges and the rest is filtered out. It was abnormal.

The ENT doc next sent me to have a magnetic resonance imaging (MRI) scan of the brain to rule out an acoustic neuroma tumor. Now that was an experience! It doesn't hurt, but MRIs are aggravating as all getout. The test came back normal. "That's too bad," said the ENT doc. "If there was a tumor, then there's something I could do for you."

We discussed my audio history. In many people my age the cause of ear ringing is 1960s-vintage rock music, which they heard live. But that was not the case because I have despised rock music for many, many

years and have never voluntarily listened to it for more than a few milliseconds (I'm a bluegrass fan). After further questioning, the doctor believes that my problem is due to ham radio.

Yep! Ham radio! The problem stems from the late 1950s and early 1960s when I was operating every day for several hours instead of doing homework (which explains my high school record!). With the receiver audio and RF gains up high, listening for a weak signal through earphones, I would frequently tune across some guy who was about 500 dB above S9, or least much, much stronger than signal I was copying. Either that, or the clown across town running a 2,000-watt loudenboomer linear amplifier into a high gain bandbuster antenna settled right on my frequency without listening first (rude!). I can remember those events causing an almost pleasurable buzz in my right ear. Those experiences caused damage to the cochlea of my inner ear. I asked the ENT doc how this problem could be prevented. Fortunately, the doc was a bit of a techie, and was familiar with ham radio and SWL operations. His advice was:

1. Wear "shooter's earplugs" under the earphones. These earplugs are used by target shooters to prevent ear damage. They have a little piston plunger inside. The plunger stays open at normal sound levels, so you can hear what's going on around you, but snap shut when a high-amplitude sound (like a pistol shot or loudenboomer signal) is received.

2. Wear the earphones a little forward of the ears, so that the ear is not fully covered. This tactic reduces the audio signal power density in the ear canal while still allowing you to hear all but the very weakest, nearly unreadable, signals.

3. Ride the volume and/or RF gain controls so you can instantly knock down the signal level if it gets louder suddenly.

4. Keep the automatic gain control (AGC) on all the time unless there is a good reason to turn it off.

To that I might add:

5. Use the narrowest bandpass filter available that is consistent with the signal you are attempting to copy. This prevents nearby band-crushing signals from causing too much havoc with your ears.

My ham radio mentor, the late Mac Parker W4II, told me exactly the same thing about keeping the earphones a bit ahead of the ears when I was 14 years old. In addition, a number of professional merchant marine radiotelegraphy operators, and a former boss (who was a chief radioman in the World War II US Navy) gave me the same advice. The ol' chief radioman was so badly affected that he had to wear hearing aids. But, dumb kid that I was, I didn't follow the advice of a pair of kindly old gents.

When I left the ENT doc's office, I asked him, "If you can't get rid of the damn ringing, will you at least tune it to the bluegrass station?" 73

SPECIAL EVENTS

Continued from page 49

Exposition Center. A 24 hr., 7 day-a-week phone line is already in operation for vendors and others seeking info. Call *(513) 661-0201.* If you wish to fax the convention, please use *(513) 531-3834.* These lines will inform you regarding vendors, tickets, flea market spaces, and forums. Cincinnati Bell's Answer-Link will allow the appropriate convention staffer to return calls and give the latest information quickly.

AUG 8

HUNTINGTON, WV The Tri-State Amateur Radio Assn. (TARA) will hold their Hamfest at the Huntington Memorial Fieldhouse at 2590 5th Ave. For more information call *Bernie Mays at (304) 743-5459, or E-mail [wb8zer@juno.com].*

SPECIAL EVENT STATIONS

JAN 3–4

MIDDLEBURGH, NY The 3rd Northern New York Section QSO Party will be held Sat., 3 Jan. 0000Z–Sun., 4 Jan. 2359Z. Open to all license classes in any mode allowed by that class. DC to daylight—must be able to communicate at least 1 km and use a minimum of one stage of electronic detection. Terrestrial repeaters are allowed if okayed by the trustee, but courtesy to other users is primary. Repeater contacts during a net operation are not allowed. The use of man-made satellites is discouraged. The goal is to work as many NNY section amateurs in as many of the ten NNY section counties as possible. For more info, send SASE with request for QSO Party rules to *Schoharie County Amateur Radio Assn., WA2ZWM, P.O. Box 1086, Middleburgh NY 12122.*

JAN 10–11

1998 HUNTING LIONS IN THE AIR CONTEST The 26th annual Hunting Lions in the Air Contest will take place 0900 UTC Sat., Jan. 10th–2100 UTC Sun., Jan. 11th, with the objective to create and foster a spirit of international understanding and cooperation among amateurs and Lions, through worldwide communication. The contest is to commemorate the birthday of the founder of Lionism, Melvin Jones, born at Ft. Thomas AZ, USA, on Jan. 13th, 1879. Operators interested in additional info regarding this contest should write to *Contest Committee, Lions Club Flen, Box 106, 642 23 Flen, Sweden; or E-mail [goran.blumentahl@swipnet.se].*

JAN 28

SAN DIEGO, CA The Challenger Middle School ARC, KI6YG, will operate a special event station to commemorate the 12th anniversary of the space shuttle *Challenger* tragedy, 1500 UTC–2400 UTC, on or near 14.250, 21.350, 28.350, and 146.52 simplex. QSL to *Challenger Middle School ARC, 10810 Parkdale Ave., San Diego CA 92126 USA.* 73

NEVER SAY DIE

Continued from page 7

pulse. Our Teletype machines were all upper-case letters, so the 32 combinations allowed by the five pulses were plenty. For numerals and punctuation we had a shift character and they were where you'd normally find capital letters.

Of course it wasn't long before newer Teletype machines were zipping along at 100 wpm throughput, leaving CW even further behind.

With the lid having been blown off the secrecy concerning the UFO crashes, I hope we'll start hearing from more people who have been kept silenced by our government. I recall a recent poll which showed that more than 70% of our people do not trust our government. And with one exposé after another of lies, corruption and cover-ups, it's a wonder that even 30% are trusting. It certainly can't be an informed group.

If you've noticed any sudden technology leaps, how about letting me know about them?

Our country was originally set up as a republic and the Constitution was a well-crafted document. But we've let democracy screw things up—that's where 51% of the people can force 49% to do what they want. And our Supremes have trashed the Constitution, allowing Congress and the President almost free rein to tax and spend, plus the buildup of government to where we have more people working for the government than are manufacturing products.

Grumble.

Art has interviewed a couple of other guys who were involved with the UFOs at Area

51 (Groom Lake NV), Bob Lazarr and David Adair, in addition to the above-mentioned chap, who was afraid to be identified.

Art also interviewed astronaut Mitchell, who said that he believes the government is covering up what it knows about ETs.

Fluorides

Yes, I'm still trying to stop you from poisoning yourself. Or, perhaps it's closer to say letting your government poison you and your family.

And yes, I'm well aware of the promotion fluorides have gotten, and how it's so wonderful for children's teeth that our caring government is putting it into most of our water supplies. So, am I an alarmist, or have I got the facts to back me up?

How about two Chinese studies comparing children in areas with high fluorides in their water with those with low? These studies showed a measurable decrease in IQ for children drinking high-fluoride water. Or a study of 39,000 American schoolchildren from five to 17 years old, which showed that children drinking fluoridated water had almost identical rates of tooth decay compared with those in unfluoridated areas?

Fluoridated water also has been shown to increase hip fractures and bone cancer. Just what you need. In the elderly, which is what you hope to eventually be, a hip fracture is often almost a death sentence.

Distill your drinking water and stop poisoning your body. Just because some companies have found a profitable market for their industrial waste is no reason for you to be sucker enough to drink it.

I don't know if you care how smart your kids are, but will you knowingly help dumb them down?

Oh, are you still using fluoride-laced toothpaste? Just don't swallow any of it. Kids have died doing that.

Killing Your Family

If you are still smoking I'm on your case again. Maybe you've read about the California EPA report that secondhand smoke is killing thousands of people every year? I think of this every time I see a smoker in a car with a defenseless family being forced to slowly poison themselves. There's something about driving that seems to force smokers to light up.

The EPA estimates that secondhand smoke causes 3,000 cases of lung cancer a year in the US, 62,000 heart disease deaths, 2,700 sudden infant deaths, plus asthma, bronchitis in children, low birthweight babies, cervical cancer, and spontaneous abortions.

Prospective employers can easily find out if a job applicant smokes just by getting into his car for a moment. And why should an employer care if an employee smokes? Well, there's the lost working time when they're outside smoking. If they only smoke eight cigarettes during a working a day that's around 80 minutes out of the day, shortchanging the company by 17%. Butt much worse, anyone who obviously cares so little about themselves is not going to be much more interested in the welfare of the company. This is not normally going to be a good worker. As I've mentioned, my worst employee nightmares have been caused by smokers.

Oh yes, smokers are out sick much more than the others, and will run your doctor bills up.

Foreign Aid

You probably haven't been reading much about this beaut, but I have. If you've done any homework on this subject you've been grabbing anyone who would listen and asking them what in hell those stupid idiots in Congress think they are doing with your money.

True, it isn't money out of your pocket. They took care of that problem back during WWII when they tapped your cash directly from your employer, before you even have a chance to see it. They figured that you wouldn't miss something you've never had. But it's *your* money they're having fun with just the same.

Now, about foreign aid. Well, it's not a biggie. So far they've only sent a little over a trillion dollars to other countries. As gifts to other countries. Free gifts. Economists figure that we've managed to do about ten trillion dollars in damage so far.

Despite the fact that there are virtually no success stories, Congress and the giant bureaucracy it has built (and maintains) with your money are continuing to poison one country after another with billions of dollars. The money, of course, doesn't get to the people who need it, just as the billions we've wasted on "fighting poverty" have not helped anyone but the care-givers in our country.

How bad is it? The UN Development Program reported last year that 70 developing countries, all getting US aid, are poorer today than they were in 1980. 43 are worse off than in 1970! The US Agency for International Development (AID) has admitted that hardly any countries receiving aid from us have ever graduated from dependent status.

What happens is that the more money we give to a country, the larger the government bureaucracy they build up to spend it. It doesn't end up helping to build a manufacturing infrastructure, it just supports more and more people shuffling paper. In India, for instance, 70% of the people are government employees. Without foreign aid India would collapse. But as long as the money comes in, free of charge, there's little incentive for foreign governments to make the needed changes.

There's plenty of investment money available to help manufacturing grow. Last year, it's estimated that $244 billion came from private investors. But only Congress is dumb enough to send buckets of money to foreign countries and get nothing in return. Except hatred.

A few years ago I proposed a new kind of foreign aid, one that would not only tend to encourage countries to invest the money for the benefit of all their people, but would end up bringing us a return of many times our investment.

What's the one thing that every country has of value? Even the poorest? Its land. So I proposed that any country that's looking for a handout should sell us some real estate which could be set up as a free trade area the way Hong Kong and Macao were when they were deeded from China. Only none of this "give-back-after-100-years" nonsense.

Okay, Israel, you need more money to support your socialist government-caused inflation? No problem—how about a few thousand acres down by Elat on the Gulf of Aqaba? That would be a great place to set up a new city and banking for the Middle East. Instead of sending Jordan a trailerload of cash every year for being friendly with us, how about swapping a few hundred acres down by Aqaba, down by the border of Saudi Arabia?

Russia is in desperate need of money, so how about slicing off a free zone up there between Russia and Finland?

These little free zones would provide room for our military to have advanced bases that don't depend on the whim of the host country not to throw us out. And it would, as in Hong Kong and Singapore, make it easy for entrepreneurs to start manufacturing businesses—with the knowledge that they wouldn't be harassed by the bureaucracy. We'd protect these areas from hostile neighbors, just as the UK protected Hong Kong.

Opportunity

New technologies, particularly if you get in there early, can make you rich. This was going through my mind as I was inputting the latest Patterson cold fusion patent for the next issue of *Elemental Energy*. The patent shows the construction details of the Patterson Power Cells.

So where's the opportunity? Well, while the energy and power giants are asleep there's one heck of a market out

there for the first products this new technology will provide. How about a small room heating unit that is 150% efficient. Or maybe 1,000%, which seems possible. It would sell like crazy. Maybe a small unit for heating water for your house? It could cut people's electricity or natural gas water heating costs significantly.

Patterson's Clean Energy Technology Inc. (CETI) is interested in working with small manufacturers to start elemental energy products entering the market. How many applications can you think of for small units that will generate heat at about a tenth the cost of using oil? I expect the size and cost of making these units will continue to drop.

So, if you have a small manufacturing company, have a friend with one, or can find one in your area that'll work on contract, get your imagination going. You could end up with a new giant industrial complex in a few years.

Eventually we'll see this low-cost source of energy providing home heat and electricity. Unless scientists come up with a new way of generating electricity from heat, we'll probably be seeing tiny steam turbines being developed which will handle the needs of a home or small business.

These units also can be used, while generating heat, to decontaminate radioactive waste. I suspect that this will eventually be of more interest to the large power companies. Imagine being paid to take the fuel instead of having to buy it! A negative fuel cost as we get rid of the millions of tons of radioactive crud we've been stockpiling and fearing.

Hey, this is not the best time to invest in coal mines or new oil drilling. In a few years we'll see investors selling the OPEC nations short as they crumble. I doubt that any of them have wisely invested their oil billions. Like our major corporations, their minds have been on the next quarter, not the next decade.

What happened to the mainframe computer companies when minicomputers came along is an example. And that was replayed when microcomputers put Wang, DEC, Prime, Data General, etc., on the ropes. The top boys have been having too much fun right now with the money to worry about the future.

How long will it be before a home power unit will sit there providing heat and electricity for years, drawing its power from a small energy cell made mostly of nickel and using plain water as fuel? Not long.

If I weren't so damned busy, and if I had a serious interest in making gobs of money (been there, done that), I'd start looking for small manufacturing firms and get a piece of the action as I got them going with this new technology.

I started from scratch with a new technology I discovered almost 50 years ago and built a manufacturing business with seven subcontracting factories, complete with national distribution. That was when I made my first million. It wasn't long before I had a yacht, two Porsches, an airplane and an Arabian horse. Whee! But somehow I just don't have the drive to do the same things over again. There are too many new things to do. Too many exciting new technologies to look into. So I keep trying to whip you into getting off the couch, away from the TV, or out of your operating chair, and exploring the excitement (and money to be made) with new technologies. 99.9% of the time I've failed, but the letters from the few whom I've inspired keep me going.

Irrelevant?

An E-mail from George Baustert W3BLW suggests that ARRL's National Traffic System (NTS) has largely been replaced by E-mail and is no longer relevant. What do you think? Most emergencies are

dealt with via cell phones and kids these days are on the Web, not the ham bands.

Amateur radio has provided me with a lifetime of adventure and excitement, but the horizons of my youth are gone. The complexity of electronic equipment has made it more and more difficult to build ham equipment, and the loss of our consumer electronics industries to Japan has cut off our supply of parts, even if we did want to build. Not that parts are used for the newer equipment anyway. It's mostly modularized and packed with ICs.

What new modes are there to pioneer? We've done NBFM, SSB, SSTV, repeaters and packet. We've got a bunch of ham satellites up there, but I was making satellite contacts 30 years ago. We were well into Moonbouncing our signals 30 years ago. In 1966 I visited VK3ATN in Australia who was working the US on Moonbounce on 2 m using a bunch of rhombic antennas. I'll never forget working my home station on 20 m (S9+) and then switching to 75 m, where my home station was also coming through S9. Wow!

So, even if the ARRL hadn't cut off the entry of youngsters into the hobby in 1965, we wouldn't have much available for them to pioneer anyway.

If we're not needed any longer for emergencies and we're not getting youngsters interested in electronics careers, and we're of no earthly use to the military in time of war, what is the rationale for amateur radio today? Please advise.

Hydrogen

Okay, I couldn't get you interested in computers 20 years ago, or joining the compact disc revolution ten years ago, or even exploiting cold fusion. Well, Never Say Die, so how about experimenting with a highly efficient way of separating hydrogen from oxygen, thus making hydrogen-driven engines feasible?

I was reading about a new approach, where high voltage pulses (10,000 volts) are put to two stainless steel plates separated by a fraction of an inch (1.5 mm). You need to use very pure water for this, otherwise there will be a low resistance through the water path. The idea is to run milliamperes of current (about 100 mA), and off comes hydrogen and oxygen which can then be burned to make a very hot flame, using a fraction of the energy it normally takes to split the gases from water.

Oh yes, I remember how you snored your way through the article I ran years ago on a legal radar jamming device. Now a bunch of companies are making them and it's a multimillion dollar business. I wouldn't be without one, since almost every police car in NH has a radar unit and speeding tickets are a significant revenue source for our towns.

This new gas generation system has been patented by Stanley Meyer. The usual approach for splitting hydrogen and oxygen from water calls for using low voltage and high current. Some sulfuric acid is used to make the water more conductive. The Meyer system uses pulsed DC, with a rectifier diode, and a detector which shuts off the voltage for a few cycles when the water dielectric between the two plates breaks down, allowing the water to "recover." Observers of the cell in action have been amazed that the cell remains cold, even after making gas for hours.

Meyer claims he's run his converted VW on the hydrogen/oxygen mixture for the last four years using six cylindrical cells. He's stimulating the reactor's gas production by piping in laser light via fiber optics.

You can look over his patents. #4,936,961; 4,826,581; 4,798,661; and 4,613,304 are available from the Commissioner of Patents, Washington DC 20231. Or you can pass up another door of opportunity.

My thanks to the KeelyNet for the above.

Joke

Here's a joke from Walt Bastow W4KVF's *Alligator* newsletter.

One night, a police officer was staking out a particularly rowdy bar for possible violations of the driving-under-the-influence laws. Just about closing time, he saw a fellow stumble out of the bar, trip on the curb, and try his keys on five different cars before he found his car. Then, he sat in the front seat fumbling around with his keys for several minutes. Everyone left the bar and drove off.

Finally, he started his engine and began to pull away. The police officer was waiting for him. He stopped the driver, read him his rights and administered the Breathalyzer test. The results showed a reading of 0.0.

The puzzled officer demanded to know how that could be, whereupon the driver replied, "Tonight, I'm the designated decoy."

Van Allen

In the March 1959 issue of *Scientific American*, James Van Allen wrote an article on "Radiation Belts Around the Earth." He explained that a ship going to the Moon would have to spend about three hours going through the belts, which are about 15,000 miles thick, and start at around 15,000 miles from Earth. His measurements showed the radiation level there varies from 10 to 100 roentgens per hour. 25 rems is considered to be the maximum possible lifetime dose for people.

In 1963 NASA engineers wrote a book stating that even minor solar storms would give people 25 rems per hour through a 1 cm thick aluminum hull.

With an average of 14.8 solar storms per day, the total minimum rem per day in space beyond the Van Allen belt is 369 rem. In 32 hours all living things except cockroaches, some bacteria, and viruses would be dying. This is why John Mauldin, an ex-NASA physicist, wrote in his book that at least six feet of solid shielding would be needed to protect anything living while traveling through space. The LEM hulls were less than .002 inches thick and the command modules weren't much thicker. (Thanks *Cynical News*.)

Shopping

While looking for something in my closet I came across my old crystal ball. I darkened my office and set the ball up on a TV table and took a look into the future.

When I was a kid my mother dragged me by the arm to the department stores downtown. Downtown New York, Philadelphia, and Washington. Then, as cars replaced subways and trolleys, shopping malls and centers appeared, dooming the downtown stores. In the smaller towns it was the supermarkets and WalMarts which decimated the small town stores.

Now we're seeing the beginning of shopping via the Internet. We've been seeing the proliferation of digital communications, with a hefty percentage of phone traffic these days being by FAX and other data transfer systems. This has caught the phone companies by surprise. They've got billions invested in wires going into homes and businesses, connected by wire and fiberoptic cables and slowed down by out-of-date switching equipment. Now they're busy installing newer, higher capacity fiber-optic cables. The day of a wire going into your home will be replaced by wireless systems.

Thus, unless some major catastrophe comes along, I see us heading towards a time when we'll be able to shop via the Web. And we'll be able to get any kind of information we want before we buy. Looking to buy a new car? Well, you'll want to read reviews by several experts. Maybe check out a survey of 10,000 owners to see how they like it. Look at a three-D video showing every feature. Even be able to ask questions of a real person via the Web. Then you can check prices and delivery of your customized model.

You'll be able to do all this from home, or from anywhere you are in the world. Nanotechnology will put the power of a stack of mainframe computers into your pocket.

Ten years ago I watched TV sets being manufactured in Korea, where everything was so automated that each set had less than 15 minutes of people time used from beginning to sitting there on the dock in a carton, ready for shipment. This made for both a more uniform, trouble-free product and for lower costs. Manufacturing in the future is going to require fewer and fewer people. Layers of administration are already being peeled as large firms downsize, with information systems replacing people.

Things are changing. We've already seen the end of lifetime employment and retirement parties for older workers. I don't think they even make pocket watches any more. We're seeing more and more people with cell phones to their ears on the street and in their cars. We're seeing homes with fax machines. We've all got computers on our desks and in our homes. A few already have them in their pockets.

I think it was about 1980 that Sony brought out their Typecorder™. Sherry and I quickly bought a couple of these laptop systems and they went with us on our trips from then on. We used them with modems to communicate between Europe and Asia and home. Then, in 1983, the Radio Shack™ Model 100 arrived. I got one the first day they came out and used it for almost 10 years. Now we take along our Macintosh PowerBooks™, writing on planes, in airport lounges, and in hotels as we travel. They provide us with the Internet, E-mail, and FAXes anywhere we are.

Laptop computers are getting smaller, lighter, faster, and provide more functions.

Keeping this almost inevitable future in mind, what are you doing so you'll be on top of the pack in 10 and 20 years?

One product that's going to be needed is education. It's going to be easy to provide it almost anywhere in the world. Schools will be needed to provide the hardware needed for learning skills, but the top teachers of the world will be available to everyone via high definition video. Anywhere. So I see the decline of universities first and then schools for the lower grades.

Many skills will be taught via simulators, just as we do with pilots today. And we have some very realistic simulators. You can feel the wheels on the runway rumbling along, and the projection out of your cockpit window looks like the real thing—except that with the flip of a switch you're flying in broad daylight, at night, through rain, or in heavy fog.

The same technology can help teach us to drive cars, trucks, buses, boats, and planes. It can teach us to use mechanical tools such as lathes. But it isn't going to teach us to drive a nail or solder a pipe joint. We're still going to need electronics, woodworking, metal working, and other shops, chemistry labs, and so on.

Welcome to the 21st century.

Recovered Memories

You've probably read about the problems that false "recovered memories" have been causing. Wild stories of childhood molestation, contacts with ETs, and so on. Having studied and used hypnosis, all this is no surprise to me.

The subconscious "mind," which is what you're in contact with when you hypnotize someone, is *very* suggestible, and will bend considerably to please the hypnotist. This is the basic reason that there are so many schools of psychiatry. A psychiatrist with a theory has an agenda to prove that theory. His patients easily sense this agenda and fulfill it for the therapist.

It is very difficult as a therapist *not* to suggest things. Therapists start to see what looks like a familiar pattern and the next thing they are suggesting something from the Freud, Horney, Perls, or other "schools." The patient, ever willing to please, confirms it. If the therapist wants ET contacts, he'll get 'em. If he's looking for incest, wow, there it is, complete with lots of lurid details.

Under hypnosis a person's lifetime of memories are easily tapped. These memories are in some way recorded in complete detail and they go right on back into the prenatal period. These are not thinking, conscious memories; they are recorded in some way, and are easily played back. They are not hidden, even though they may be long gone to the person's conscious recall.

When I first ran into prenatal memories I didn't know if they were real or imagined, even though I made every effort not to in any way guide the patient. Out they poured, so I made notes and then later checked with the patient's mother. She was astounded and confirmed that they were real and contained information that there was no other way for the patient to know.

Then I ran into past life memories. When I treated 'em just as I would any present-life trauma, the patients would be cured of the physical or mental problem we were treating. I didn't care if they were real or not, as long as dealing with 'em did the job. I did pursue enough of these recovered memories to get the idea that we've had past lives and the memories of them are there, easy to contact under hypnosis. And that suggests that the recordings of what we've seen, felt and done are somehow stored other than in our physical bodies. Recent studies at several universities have been coming to this same conclusion.

Yes, I've seen patterns. For instance, people who are afraid of the water often jump to past drowning deaths under hypnosis. And erasing the pain from the drowning incident gets rid of the present life problem for them.

We still have a lot to learn about the mind, memories, past lives, and so on. And yes, there are some legitimate recovered memories of childhood molestation and ET contacts.

Quality of Life

How come New Hampshire is one of the fastest growing states in the country? It's the quality of life, and every magazine that's surveyed the subject has come up with the same answer. Our population has grown by 55% in the last 25 years, more like a Sunbelt state. Our lack of a state income tax means that we're able to keep more of what we earn. Our property taxes are high, so though we can keep more of what we earn, if we decide to show off with an expensive home, that costs us. The state gets 61.3% of its revenues from property taxes. It's the only state getting more than 50% of its revenues this way.

We also have much less government than most other states. Vermont, next door, spends 10% more than we do on government. They spend a whole lot more on schools per child and we get better results on standardized tests.

Apparently the long, cold winters, mud season, flying biting insect seasons and roadway-clogging tourist seasons haven't discouraged people from moving here. Mud? I live on a dirt road, so I can testify to the mud in the spring, narrow roads in the winter, with snow piled high on each side, and corduroy in the summer, with clouds of dust following the occasional cars. In October the hotels fill up with fall foliage gawkers. In

January and February it's skiers. In July and August it's vacationers heading for the White Mountains and lake country.

Oh yes, in 1970 our per capita income was $162 below the national average. Now it's $1,800 above.

Getting back to the property tax business, the whole concept irritates the hell out of me. What this means is that the state owns our homes and property and we, in reality, are renting 'em. If we fail to pay the rent we're thrown out. I like the idea of working so I can actually own things, not just be able to rent better things.

Meteors

A card from K1WHS confirmed a 2 m meteor scatter contact with N8XA mobile, who was using a simple 5/8λ vertical antenna on his car and a three-watt Yaesu FT-290R barefoot. Dave was doing most of the work, with his 336-element beam and a kilowatt. I had a similar setup (336-elements and a kilowatt), plus the advantage of a 2,200 foot elevation. I had no problem working HTs in New Jersey and even down to West Virginia. A chap in Hampton (VA) said that even with the worst of conditions my signal was an S-7. With signals like the one from K1WHS you, too, should be looking out for him on meteor scatter and during auroras.

Heartening

I enjoy it when the *New England Journal of Medicine* confirms what I've been preaching vs. what doctors have been saying (and making billions saying it). It turns out that several recent studies have shown that heart attacks and stroke are the result of a lowered immune system rather than cholesterol and high blood pressure. Yes, hypertension and clogged arteries contribute to a lowering of the immune system, which is kept busy trying to clean up the mess your mouth is making of your body. But obviously the other factors which contribute to the weakening of the immune system can't be ignored. Like your not bothering to take supplementary minerals and vitamins to replace those no longer available in our food supply. Like not learning to relax and reduce as much of the stresses of your life as you can. I recommend a good solid daily dose of good music, meditation, and a two mile very brisk walk—in the sun—without wearing your glasses.

You aren't going to choke your arteries with cholesterol if you eat mainly raw fruit and vegetables, which are what your body is designed to process. McDonald's™ should have a skull and crossbones instead of golden arches for their logo. Well, I'm not going to go through all that again, but it's nice to see more scientific studies backing up what I've read in the books reviewed in my *Guide*.

Human nature being what it is, and you presumably being human, I expect you'll nod your head and continue doing as you have until the Great Kahuna (a.k.a. Mother Nature) knocks you on your ass with a brick. Then comes the bypass surgery, which nets the doctors billions and doesn't extend your life or quality of life measurably. Look it up. It's the same with the chemotherapy and radiation treatment scams for cancer. Hey, look it up and see if I'm exaggerating.

Yes, I'm frustrated. I've done a lot of research on how to get over almost any chronic illness and how to extend your life 20-30 years in robust health, but I know you aren't going to pay any attention and are going to suffer and die early as a result. Oh, you'll go for a quick patch for problems you've spent years generating, but making a major change in your diet and habits is asking too much, no matter how big the payoff. Tell me I'm wrong, please?

PROPAGATION

Jim Gray W1XU
210 E Chateau Circle
Payson AZ 85541
[jimpeg@netzone.com]

Happy New Year!

Except for the period between the 11th and 19th (which is expected to range from Poor to Very Poor), conditions on the HF bands ought to provide normal seasonal propagation. The northern hemisphere is tilted away from the sun and hours of daylight are less than in spring, summer, and fall. Therefore solar radiation is less, hence UV ionization of the upper atmosphere will be less. That, combined with the low 10 cm solar flux values, will probably produce a rather disappointing month for DXers: fewer band openings and early closings. However, operators using the 160, 80, and 40 meter bands will enjoy low noise levels and around-the-world propagation during hours of darkness.

The chart shows the first ten days and the last ten days to be about as good as one can expect for a January at the beginning of a new solar cycle.

El Niño has been forecast as being the strongest of this century, and weather conditions around the globe may be quite different from "normal" for the next year or two. In particular, the few days centered on mid-January could provide exceptional atmospheric disturbances ... so be prepared!

10–12 meters

Generally Poor, except for occasional transequatorial propagation with F2 openings on the best days—most likely South and Central America.

15–17 meters

DX to Africa and Latin America on the Good days possible, with short-skip out to about 1,000 miles or so in the US.

20 meters

Your best band for DX openings around the world from dawn to dark, and openings to the Southern Hemisphere after dark in evening hours. You can expect excellent short-skip during the daytime to 2,500 miles or so.

30–40 meters

These bands ought to be open for DX from just before sunset to just after sunrise. Signals from the east should peak until midnight, and after midnight to other areas. Daylight short-skip of about 500 miles will be possible, and nighttime short-skip to 1,500 miles or more will be available.

80 meters

Occasional DX to various areas of the world should be possible between sunset and sunrise when QRN levels permit on Good (G) days (see calendar), and also short-skip during hours of darkness to 1,500 miles or more.

160 meters

Following the usual summertime slump, this band ought to begin to come alive again during the hours of darkness when QRN permits. Try the days marked (G) on the calendar for best results. DX toward the east until midnight, and to other areas afterwards, until dawn. Short-skip to 1,500 miles will prevail when the band is quiet.

Remember to let me know how these forecasts are working for you. Your feedback is much appreciated. W1XU. 73

JANUARY 1998

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G	2 G	3 G
4 G	5 G	6 G	7 G	8 G	9 G-F	10 F-P
11 P	12 P-VP	13 VP	14 VP-P	15 P	16 P-VP	17 VP
18 VP-P	19 P-F	20 F-G	21 G	22 G	23 G-F	24 F
25 F-G	26 G	27 G	28 G	29 G	30 G-F	31 F

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
RUSSIA (C.I.S.)							20	20				
SOUTH AFRICA									15	15	15	
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
RUSSIA (C.I.S.)								20	20			
SOUTH AFRICA										15	15	20

WESTERN UNITED STATES TO:

ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
RUSSIA (C.I.S.)									20			
SOUTH AFRICA										15	15	
EAST COAST		80	80	40	40	40	40	20	20	20		

The Good News

Well, there isn't any. The bad news is that the FCC's September new licenses report showed the no-code Techs to be down 42% from last year and down 57% from 1995. The General Class upgrades were down 27% from 1996. 83% of the new licenses were no-code Techs, so there was just a dribble of anything else. I'm not aware that the League is doing anything whatever to change this downward spiral except make it worse by continuing their relentless fight to use the code to keep as many newcomers from coming into the hobby as possible. Well, that's one way to reduce the QRM on our bands. Now we won't have to bother developing new technologies. 73

Number 88 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls. The deadline for the April 1998 classified ad section is February 12th, 1998.

HAM GOODIES! Free Shack Attack Catalog. (801) 878-2760, [kb7vrd@aol.com], [http://www.vcnet.com/sa]. BNB45

Audio Equipment Wanted: 1930s–1960s. Tube-type amplifiers, large or small speakers, mixers, microphones, tubes, parts, etc. Especially Western Electric, Jensen, Marantz, MacIntosh, JBL, etc. **1-800-251-5454** BNB202

FM MICRO/LOW POWER BROADCASTING 88–108MHz. PLL Transmitters/RF Amplifiers/Antennas. Mono/Stereo, 50 mW to 100 W. Free catalog/info; call (250) 642-2859, or E-mail: [kscott@pinc.com]. **R. Scott Communications Ltd.** We ship worldwide from Canada! BNB102

RF TRANSISTORS TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, etc. **WESTGATE** 1-800-213-4563. BNB6000

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send $1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

RIGS FOR SALE: YAESU FT101EE with FTV650B $400.00. YAESU FT890 excellent condition $1000.00. KENWOOD TS140S excellent condition $800.00. CW Filters in all rigs. **RUSS N7BKW**, (801) 972-5873. BNB706

BIOELECTRIFIER™ 5 Hz micro current supply for plant and animal research. Semi-Kit $38.00. Assembled complete with batteries and silver electrodes $89.50. Add $2.50 postage. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB343

The Communicator's HandBook: A reference guide for the professional engineer or radio DXer with a list of **FREE** catalogs and much, much, more!! To order send $9.98 U.S. check/m.o., Canada $13.50 int'l postal m.o. to: S. Crawford, P.O.Box 83, Riverdale NY 10463. **Fast FREE shipping.** BNB749

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, $74.50. Same, but DC powered, $54.50. Add $2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB342

FOR SALE: Ham & FM Broadcast Test equip. of my late dad, W3HLF, former EE, self-employed radio broadcast engineer, FB father. Many Heath items, some with manuals. Bird, Potomac, vintage AM ham components including 1kW Xmtr., Collins, Hallicrafters, Hammarlund. Lotsa tubes, parts, unk. breadboards, chassis, business inv. Will consider lot sale on tubes, other items. Sold as is. Call **Bill Marshall** at (814) 459-3231 for list after 3 p.m. ET. BNB725

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H BNB420

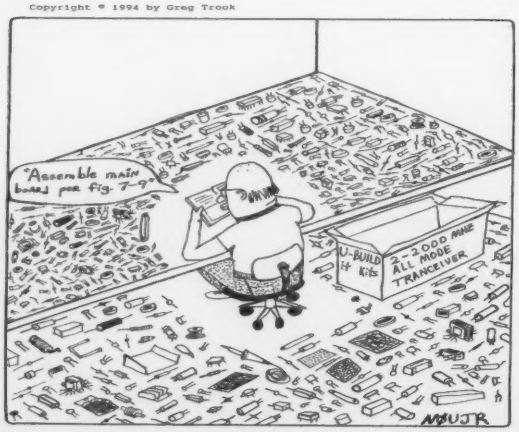
BREAK THE CODE BARRIER: A self-hypnosis tape that allows you to learn or increase code speed easily and quickly. To order send $14.95 + $3.00 S&H to Dr. Hal Goodman, P.O. Box 184, Eastport ME 04631. For more info send SASE or [http://www.nemaine.com/w3uwh/morse.htm]. BNB2031

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone:** (616) 925-5899, 8–4 ET. BNB964

CLASSIC RADIOS. RadioFinder Web list revised weekly: [www.radiofinder.com] Tel/FAX 1-(313) 454-1890, [finder@radio.com]. BNB700

ASTRON power supply, brand-new w/ warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249, **AVT**. Call for other models. **(626) 286-0118.** BNB411

TIRED OF IRONING? PCB service. No $ setup, free scanning available. **FIRST PROTO**, 4201 University Drive, #102, Durham NC 27707. (919) 403-8243. BNB5005



Kit fun.

The New Approach to HF Radio!

The Kachina 505DSP Computer Controlled Transceiver

- Works with any Computer Running Windows 3.1, 95 or NT
- Covers all Amateur HF Bands plus General Coverage Receiver
- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
- Band Activity Display with "Point and Click" Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at http://www.kachina-az.com for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

KACHINA COMMUNICATIONS, INC.

JRC

JST-245

160-10 Meters PLUS 6 Meter Transceiver

Fifteen reasons why your next HF transceiver should be a JST-245. . .

1 All-Mode Operation (SSB,CW,AM,AFSK,FM) on all HF amateur bands and 6 meters. JST-145, same as JST-245 but without 6 meters and built-in antenna tuner.

★ JST-145 COMING SOON ★

2 MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.

3 AUTOMATIC ANTENNA TUNER • Auto tuner included as standard equipment. Tuner settings are automatically stored in memory for fast QSY.

4 MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.

5 GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.

6 IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.

7 QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.

8 NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.

9 DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.

10 CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.

11 DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.

12 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.

13 COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.

14 ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.

15 HEAVY-DUTY POWER SUPPLY • Built-in switching power supply with "silent" cooling system designed for continuous transmission at maximim output.

JRC *Japan Radio Co., Ltd.*

430 Park Ave., 2nd Floor New York, NY 10022 Phone: (212) 355-1180 Fax: (212) 319-5227

CIRCLE 159 ON READER SERVICE CARD